THE

ELECTRICAL REVIEW.

VOL. LXVIII. JUNE 9, 1911. No. 1,750.

ELECTRICAL REVIEW.

Vol. LXVIII.] CONTENTS: June 9, 1911. [No. 1,750.

	Page
The Hulton Pit Disaster	905
German Enterprise in South America	906
The Lay-Out of Workshops	906
The Packing of Electrical Apparatus for South Africa	907
Correspondence :—	
Induction on Telephone Circuits	908
Esprit de Corps amongst Contractors	908
Aluminium Conductors	908
Aerial Telegraphs and Factors of Safety	908
A Legal Query	909
Arc Lamp Suspensions	909
An Electrical Omnibus Line with Overhead Supply (*illus.*)	909
Slow Alteration and Spontaneous Combustion of Coal exposed to Air (*illus.*)	910
Electrical Publicity	911
New Electrical Devices, Fittings and Plant (*illus.*)	911
Legal	913
Hulton Colliery Explosion	914
Some Recent Telephone Decisions	914
Business Notes	915
Notes	921
Electrical Illuminations for the Coronation (*illus.*)	923
Hampstead Electric Showrooms (*illus.*)	928
City Notes	930
Market Quotations	934
Stocks and Shares	934
Share List of Electrical Companies	935
Metal Market.—Fluctuations in May	937
Reviews	937
Notes on Electric Street Lighting (*illus.*) (*continued*)	939
Proceedings of Institutions :—	
The Mechanical Design of Induction Motors (*illus.*)	941
Foreign and Colonial Tariffs on Electrical Goods	943
Patents Expiring in 1911	943
New Patents Applied For, 1911	944
Abstracts of Published Specifications	944
Contractors' Column ... Advertisement pages xxiv and xxvi	

THE ELECTRICAL REVIEW.

Published every FRIDAY, Price 4d.

The Oldest Weekly Electrical Paper. Established 1872.

TO BE OBTAINED BY ORDER FROM ANY NEWSAGENT IN TOWN OR COUNTRY.

OFFICE:—4, LUDGATE HILL, LONDON, E.C.

Telegraphic Address: "AGEKKAY, LONDON." Code, A B C.

Telephone Nos.: Holborn 933; Central 4425 (Editorial only).

ALL Letters should be addressed to the Proprietors, H. Alabaster, Gatehouse & Co.

ADVERTISEMENT RATES ON APPLICATION.

The "Electrical Review" is the recognised medium of the Electrical Trades, and has

BY FAR THE LARGEST CIRCULATION

of any Electrical Industrial Paper in Great Britain.

SUBSCRIPTION RATES.—Per annum, postage inclusive, in Great Britain, 18s. 6d.; Canada, £1 1s. 8d. ($5.30). To all other countries, £1 10s.

BINDING.—Subscribers' numbers bound, including case, for 4s. each volume.

CASES.—Cloth Cases for Binding can be had, price 2s. 6d. each; post free 2s. 9d.

FOREIGN AGENTS. — New York: D. VAN NOSTRAND, 23, Murray Street. TORONTO, ONT.: WM. DAWSON & SONS, LTD., Manning Chambers. Paris: BOYVEAU & CHEVILLET, 22, Rue de la Banque. Berlin: ASHER & Co., Unter den Linden.

Cheques and Postal Orders (on Chief Office, London) to be made payable to Mr. H. ALABASTER, 4, Ludgate Hill, E.C.

THE

UNIVERSAL ELECTRICAL DIRECTORY

J. A. BERLY'S).

1911 EDITION

H. ALABASTER, GATEHOUSE & CO.,

4, Ludgate Hill, London, E.C.

HULTON PIT DISASTER.

IN our issue of May 12th we commented upon a report by the representatives of the Miners' Federation of Great Britain, in which it was stated that the cause of the explosion was a spark from the "face" conveyor switch, with which we entirely disagreed; we gave our reasons for so doing, and suggested that the original ignition was in all probability caused by a damaged safety lamp.

It is interesting, therefore, to find this view corroborated by Mr. R. A. S. Redmayne, H.M. Chief Inspector of Mines, whose report has just been issued, in which he says: "I have come to the conclusion that the explosion originated at the point where the persons were engaged in working at a fall at the furthest in-bye point of the intake air-way of the No. 2 face of the North Plodder. In all probability a second fall took place immediately before the explosion, accompanied by the liberation of a quantity of gas, and this gas was, in my opinion, *ignited by a safety lamp* becoming overheated, falling through the gas, or by its being damaged by the fall of stone." (The italics are ours.) The safety lamp in use was the "Wolf" lamp, which burns naphtha, and is fitted with a phosphorus frictional relighter strip, which enables the lamp to be relighted anywhere in the pit; but to prevent the lamp being relit by an unauthorised person before being examined, it is provided with a screw-key arrangement whereby the relighter can only be put into operation by a properly authorised person who is provided with a key. Unfortunately it has been proved that the relighter can be operated by a strong bent piece of wire or a horse-shoe nail; and in the case of Hulton Pit it was alleged that keys were in the possession of persons who certainly were not authorised, and who rendered themselves liable to punishment if discovered relighting a lamp by any such means. As Mr. Redmayne points out, the temptation to a man whose lamp has been extinguished to relight it in the dark without examination is considerable, and we may mention that we have heard a colliery manager express the opinion that he would not adopt such a lamp, as he himself might be tempted to do such a thing. One must always remember that constant association leads one to ignore the likelihood of danger, and the old adage "familiarity breeds contempt" was never truer than in this respect; hence the importance may be fully realised of never allowing a lamp to be relighted under any circumstances until it has first been examined by an authorised person, and as Mr. Redmayne points out, it was all the more important in the case of Hulton, where much gas was given off. The lamp is an excellent one in other respects, as it gives a splendid light, and small percentages of gas can be easily detected. Probably no system of relighting lamps has yet been devised to compare with that of electric lighting, especially for relighting underground. With this now well-known apparatus it is

impossible for an unauthorised person to relight a lamp, and further, it must be brought out-bye to the relighting station, where the apparatus is placed, and examination is thus not only assured, but the lamp is relighted in a safe area.

So far from the electrical plant contributing to the accident, Mr. Redmayne expresses the opinion that, generally speaking, the plant was mechanically and electrically sound, was properly erected and well maintained, which is sufficient, we think, to restore the confidence of the workmen who may have allowed themselves to be influenced by the foolish and unwarrantable statement of their representatives. A further point of interest as regards Hulton was that the ventilation was maintained by underground electric fans, and it is satisfactory to note that Mr. Redmayne considers that the volume of the air current was ample for the adequate ventilation of the mine.

It would, of course, be too much to expect the two gentlemen responsible for the report to the Miners' Federation to withdraw it in its entirety, but in view of Mr. Redmayne's report, based as it is on the highest technical investigation, the least they can do is either to admit that they have been hasty or ill-advised in arriving at such a conclusion, or otherwise qualify the gross misstatement they put before the miners of Great Britain. Instead of condemning and vilifying the use of electricity in mines in such haphazard fashion, they would much better serve the interest of those they represent if they would inquire a little more into the advantages of its installation, and if they have any doubt as to its safety, or think that it is being used as a menace to the miner, we would suggest that the Federation appoint a fully qualified electrical engineer to inspect installations, investigate complaints, and generally safeguard their interests. Mine owners and managers, however, realise fully that accidents are costly, and they may be safely left to manage their own affairs in view of the fact that they know quite well that "prevention is better than cure."

As regards the safety-lamp question generally, Mr. Redmayne points out that a safety lamp, even when in a state of proper repair, is *only safe under certain conditions*, and it would seem as if the time had arrived for the introduction of a safer and more reliable means of lighting mines; he further states that the electric lamp, which provides a light absolutely shut off from the atmosphere, certainly deserves the most serious consideration of mining engineers and others connected with the working of "gassy" mines. An objection hitherto has been that "gas" could not be detected, but a certain number of inspectors could always be provided with ordinary safety lamps, which would be comparatively few compared to the total number of lamps employed. The prize of £1,000, however, recently offered by a colliery proprietor through the Home Secretary for the best miner's electric lamp, may do much to solve this important problem.

German Enterprise in South America.

The report for 1910 of the German Transmarine Electricity Co. (Deutsch Ueberseeische Electrizitäts Gesellschaft) does not refer to any applications made to the Buenos Ayres city authorities on the part of any possible rivals for concessions to supply light and power in that locality, and it is, therefore, reasonable to assume that such requests, as rumoured a few months ago, have either not been proceeded with or are deemed to be hopeless, in view of the strong position already occupied by the German company at the present time. Nevertheless, the company continues to pursue the policy of participating in other electrical undertakings in that part of the world, so as to make certain that competition shall be avoided wherever it is possible to do so. Thus the company has acquired a majority of the preference and ordinary capital in the Compania Argentina de Electricidad of Buenos Ayres, which was formed in October 1909, whilst a majority control of the capital in the Empresa de Luz y Fuerza, of Buenos Ayres, has also been obtained. During 1910 the ordinary capital of the Transmarine Co. was increased to £4,500,000, and a fresh augmentation of a similar amount has been made in the present year, thus raising this class to £5,000,000; and the further issue of bonds made this year brings the obligation capital up to £4,250,000, making a grand total of £9,250,000. The directors' report states that the sales of the electricity works in Buenos Ayres advanced from 100,830,000 KW.-hours in 1909, to 129,000,000 KW.-hours in 1910, and the capacity of the stations at the end of last year was 74,010 KW., as contrasted with 46,710 KW. at the close of 1909. As an illustration of the growth in the demand, it is mentioned that the Dock Sud station, which was only opened in May, 1910, with plant of 30,000 KW., will have to be extended by the addition of 27,500 KW., and measures have already been taken so that the extension shall be completed by the middle of 1912. The company is also largely interested in the Chilian Electric Tramway and Light Co., the Valparaiso Electric Tramway Co., the Transatlantica Tramway Co., of Monte Video, and in other electrical undertakings. The accounts show that £221,000 has been placed to depreciation account for 1910, as against £143,000 in 1909, and the net profits are returned at £493,000, including the balance forward, as compared with £417,000 in the preceding year. It is proposed to pay a dividend of 10 per cent. for last year, this rate comparing with 10 per cent. in 1909 and 9½ per cent. in each of the three preceding years.

The Lay-Out of Workshops.

In old workshops that have grown to their present dimensions by a series of extensions more or less promiscuously stuck on when their need was felt, the expenditure due to the complicated arrangement is often very great. When a new works is laid out, it is an essential feature of a good design that every part is easily accessible, and more particularly to such other parts as are most frequently in touch with it. Thus, the foundry and the pattern shop ought to be as near each other as safety will allow.

Some shops are laid out in a long straight line as though the one idea at the bottom of the design was to bring materials in at one end and to turn out finished products from the other. This idea is a good foundation from which to start, but it must not be carried too far. Let us suppose such an idea to be carried out. To begin with, there would be the offices, the drawing office and the pattern shop, followed by the foundry and fettling shop. Further along the line would be the heavy tool shop, and then the light tool shop, and finally the erecting, testing and shipping departments. At once the error of such a lay-out is apparent in the great distance from the office to the shipping department. And again, the supply of materials to the pattern shop and foundry must come, say, by rail, past the loading berths, and at once it is seen that the works have already taken on a double line of shops and railroad. Now, if that long line of workshops were bent into the form of a hollow square, with the offices occupying one side of the square, the next side would be occupied by the foundry and pattern departments, the third by the machine shops, and the fourth by the erection and testing and loading departments. At the rear of the square would be a separate power building, and the railway would run along two sides, so as to bring in

iron to the foundry and carry off finished articles from the opposite side.

With space for a central garden, this lay-out is a good one for a country town; but it involves a good deal of walling, and the foundry can never be included with other shops. In any case, the pattern shop and store should lie outside the square to avoid fire danger, and form a separate building, and the fettling shop is often preferably outside the foundry, though for heavy castings it is well to keep them under the foundry crane. On the whole, however, there should be a space between the fettling shop and the machine shop, so that grit may be kept out of the latter. In this general lay-out it is supposed that the railway enters at the back or furthest from the offices, and that it branches two ways. The inner courtyard implies large external dimensions to the square of buildings, and is utilitarian only because it affords scope for better side lighting of the surrounding buildings. In a more utilitarian design there would be a front building for offices, with a fireproof cellar suitably warmed for a drawing and papers store. Separated from it perhaps by 20 ft. would be one large rectangular building, divided into a number of bays, of which one at least would have an inner wall to shut it off from the rest of the building. The other bays would only be separated by the line of roof-supporting columns. This large shop would thus consist of the first-named long single building cut into short lengths, and these laid side by side.

They would all communicate at each end by a transverse line of rails for the carriage of parts from place to place, and all would be near the offices. The details and arrangement of the different bays would depend upon how the railway siding entered the ground, and how it could be made best to serve the three departments of coal, raw material and finished goods.

The large rectangular parallel shops are thus better than the long line of shops in series, for they minimise the time spent by men in going to and fro, especially where the entrance is at one end and men must enter their time so far from where they work. In a long shop the walk to the office is very extended, yet there must be frequent communication between the office and the packing or testing departments. A long shop is a continuous expense to run by reason of these many little losses of time. Further, a long shop in series cannot be extended conveniently. Where the various departments are laid out in parallel bays, any or all of the bays can be extended. A long or series shop is a finished shop, and can only be extended by excrescences from its side walls, thus introducing the old system of haphazard growth by putting up buildings out of line, and involving, perhaps, the further removal laterally of the railway sidings. In the best lay-out there will be some inconveniences and some oversights, but there will be a minimum if the open-bay system be adopted, minimising brick walling and supporting the roof bays by columns. An open shop of this kind will be clearer and lighter, the roof of one bay furnishing light to adjoining bays, and the united action of all the lighting giving a more completely shadowless effect.

Messrs. Tilling's New Petrol-Electric Omnibus.—On Friday last, through the courtesy of Messrs. Thos. Tilling, Ltd., we were able to inspect their latest type of petrol-electric 'bus—a light-weight vehicle which has been developed as the result of their experience with the S.B.S. type of vehicle, which was described in our issue of January 17th, 1908. We believe the original 'bus, which it may be recalled had an independent electric motor and worm drive to each rear road wheel, has covered over 120,000 miles to the satisfaction of the owners, and shown a considerable saving in running costs over the purely petrol-driven 'buses owned by Messrs. Tilling. The new vehicle, which has been developed directly on this extended experience, and is much simpler in design, is expected—in fact, can scarcely fail—to improve on the running of its predecessor. A trial run from the new R.A.C. building in Pall Mall to Bromley and back left an impression of most comfortable and easy riding, towards which, of course, the electrical speed control facilities especially contribute.

We hope to describe at greater length in a future issue the features of this vehicle, for which the chassis, engine and body were constructed throughout in Messrs. Tilling's own works, and the electrical apparatus by Messrs. W. A. Stevens, Ltd., Maidstone, under the Stevens patents. Great credit is due to both of these firms, not only for assiduously tackling an admittedly difficult problem, but also for publishing the results of their experience.

THE PACKING OF ELECTRICAL APPARATUS FOR SOUTH AFRICA.

[COMMUNICATED.]

IT may interest some British firms to know that the larger portion of the electrical machinery and kindred apparatus consigned to South African ports is not packed in a manner altogether suitable for this market.

In many instances it would appear that those responsible for the packing assume that "anything" will do for abroad, and although in some cases the arrangements would probably be good enough for a short journey in England, they fail lamentably when the goods are subjected to the rougher handling caused by the loading and off loading at the ports, and also to the excessive variations of temperature they undergo before reaching their final destination.

Makers often fail in other matters connected with packing, such as packing specifications, descriptive markings, and general information, which, in South Africa (for reasons shown later), are most important factors in the successful assembling, installing, and general working of the apparatus. Shipping freights being mostly charged on the cubic measurements, this necessitates a far greater dismantling of machinery (so as to reduce the space occupied) than would be the case if the same goods were being dispatched to some purchaser in England, and it is most important that the various parts should be carefully marked before packing so as to ensure the correct assembling of same.

It is, of course, very simple for those thoroughly versed in the general arrangement and working of any special electrical appliance to assemble the parts and install correctly, but the engineer in South Africa probably has not had actual experience of this apparatus, and he has to rely solely on plans and information received from the makers. In some cases plans or other instructions are not forthcoming; in others, the information is most meagre, and when it also happens that the packing specifications are lacking in detail, the various portions of the apparatus, when unpacked, somewhat resemble a Chinese puzzle. In a few cases portions of machinery have actually been buried by erectors, rather than display their want of knowledge as to how they should be fixed.

The protection of apparatus to guard against breakage is only one of the important factors necessary to successful packing, and unless more attention is given to the others, English manufacturers will continue to lose a large portion of South African business which they otherwise might obtain.

Take the American or German manufacturers: in all instances diagrams, or carefully detailed instructions in the form of a pamphlet, are placed in the actual cases containing the goods, and the engineer has no difficulty in installing these in the proper manner necessary for their successful working.

Most special care should be given to the packing of machinery sent to South Africa, as if any part is damaged it cannot be repaired under seven or eight weeks at least, even if it be standard material, and the damage may not be discovered until the apparatus is being put into use.

Heavy machinery not in cases should have all the more important parts specially protected from damage by knocks or moisture, bright parts be covered as well as greased, and all special nuts or bolts carefully greased.

The more delicate parts of apparatus packed in cases should be "stayed" wherever possible, and well insulated from vibration with woodwool or other soft and (where necessary) non-hygroscopic material.

Cases containing very brittle or delicate apparatus should be screwed together, and the screws entered with a screwdriver, not a hammer (several consignments of metallic-filament lamps have arrived in South Africa with 50 per cent. of the filaments broken through hammering screws into lids of cases).

Goods pervious to moisture should be protected with material of a non-hygroscopic nature, and where practicable placed in hermetically sealed cases.

If makers would realise what a great effect efficient

packing has in the placing of future orders, they might pay more attention to this most important department of their business, as numerous instances could be given where bad packing has indirectly been the cause of "non-repeat orders." Reiterating, all possible care should be taken so that the consignee not only receives the articles in good condition, but has all the information necessary for their satisfactory installation and working, no detail being too trivial, and nothing must be left to supposition.

If careful consideration is given to the few points enumerated above and a little more care and judgment is exercised by those responsible for "packing," it will be found that any extra time and expense which may be incurred will be more than amply repaid by "repeat orders."

CORRESPONDENCE.

Letters received by us after 5 P.M. ON TUESDAY *cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment No letter can be published unless we have the writer's name and address in our possession.*

Induction on Telephone Circuits.

With reference to "Cheshire's" inquiry in your issue of May 19th, the telephone lines may be run straight and on the same poles as the three-phase wires, provided care is taken in transposing the three-phase lines, since by transposition the power lines are made electromagnetically independent, not only of each other, but also of any other line.

The three-phase wires should be run so as to form the corners of an equilateral triangle, and if power is only taken from the end of the line, they should be transposed twice at equal intervals, but if power is taken from intermediate points the wires should be transposed twice at equal intervals between each point or station.

If the three-phase wires are not transposed, then the telephone lines must be metallic throughout the length affected, and transposed at least five times at equal intervals; care must also be taken that the telephone lines are carried the same distance apart from the three-phase lines throughout.

C. W. Westwood.

London, N.W., *June 2nd*, 1911.

Esprit de Corps Amongst Contractors.

Unfortunately, amongst present-day electrical contractors this spirit does not prevail; in fact, cohesion in this branch of the electrical trade is as defunct as the fabled "City of Atlantis." I cannot think this state of affairs is caused through competition, but rather through loss of respect for the trade they are members of; I, furthermore, think this is one of the chief factors which have caused the electrical contracting business to get into the state of chaos which prevails at the present moment. During the last few years, I am reluctantly compelled to state, I cannot point to a single exception where I have known an electrical contractor (called in to finish a half-completed job) who has not traduced his predecessor's work, generally without any reason whatever. This despicable practice of running down other people's work is found fully matured in the small electrical contractor (*i.e.*, what are generally termed "one-man firms"), it being part of that gentleman's daily routine, and as such (when in conversation with a prospective client who has been wise enough to get two or more estimates), he will make use of the following stock phrases, "So-and-So only employs boys and apprentices"; "the supply company always have trouble with So-and-So's work"; "he buys exhibition material"; and our gentleman frequently ends up with the infamous lie, "The supply company connect up my work without a test." This calumny does not inspire confidence, and the client naturally thinks that if one contractor errs the others may do the same. *Result*, the client gives his work to the supply company or a first-class firm of furnishing drapers or builders. The following is a typical case (one of many) which has come under my notice. An electrical contractor installed a new motor to drive a printing machine, everything being left satisfactory to all parties concerned. A few weeks afterwards another contractor obtained an order to install a few electric light pendants near the motor; the work was finished satisfactorily, therefore the incident should have closed, but our friend the contractor being asked his opinion regarding the motor (and knowing the printer had no electrical knowledge) coolly condemned the new motor, saying it would be a source of trouble in the near future, at the same time recommending another make and offering to take the present machine in part payment. I will leave the reader to imagine what followed, taking into consideration the fact that payment for the motor was not completed. I do not include private reports and expert opinion in my survey, but refer more particularly to instances where a contractor, called in to repair a faulty installation, wantonly attributes the same to the faulty work done by the contractor who did the original work, usually without being asked to give an opinion. In conclusion, my advice to contractors when about to traduce another man's work, is to remember the old phrase "Cui Bono" (Who gains by it?), and that *esprit de corps* amongst any body or trade tends to inspire confidence, high business morals, and lastly, but equally important, living profits.

Percy Collins.

Wimbledon, *June 2nd*, 1911.

Aluminium Conductors.

In your review on Mr. W. Brew's book on "Three-Phase Transmission," you state that copper has a permanent intrinsic value, and that aluminium has not.

With this we cannot agree. Aluminium has a definite scrap value in relation to the current price of the metal, just as copper has, and we are prepared to credit customers with the value of their scrap in part payment for new conductors, in exactly the same way as is done by the copper people.

It is true that the scrap value of aluminium is not equal to that of copper, but as an aluminium conductor at present market prices costs some 35 per cent. less than the copper equivalent, the interest on the capital saved will, as a rule, meet the lower scrap value.

The British Aluminium Co., Ltd.
ARTHUR JACOB.

London, E.C., *June 1st*, 1911.

Aerial Telegraphs and Factors of Safety.

The article entitled "Aerial Telegraphs on English Railways," which you published in your issue of March 31st last, was no doubt read with great interest by many of your readers, because evidently from the pen of a practical man, who knows what he is writing about.

With reference to the mention of the factor of safety of 4, with a minimum temperature of 22° F., usually allowed in Great Britain, and no doubt adopted in many other parts of the world, it occurs to me that it may be well to point out, for the benefit of those abroad, that every individual country should have its conditions studied and the factor of safety to be allowed should only be decided after very careful consideration. Not only so, but in certain cases a telegraph line must be divided into sections, or zones, and the factor varied in accordance with the conditions ruling for each.

Take, as an example, a telegraph line starting from a tropical seaport and extending, say, to the interior of a country like Bolivia, reaching an altitude of 13,000 ft. and subject to a range of temperature of perhaps 100° F., with a minimum night temperature of 0° F. It would be absurd to allow a uniform dip to the wire, say, in accordance with Post Office rules, all through such a line, and therefore it should be varied as may be necessary after taking into consideration the extremes of temperature, the conditions of weather to be encountered, the probable rate of oxidation of the wire, and other local peculiarities.

As has been often pointed out, it is just as much a fault to allow too much dip as too little, and the evil of too much is, of course, exaggerated in cases where long spans are used. Even although the wires may be placed at exceptionally large distances apart, with such spans, contacts caused by whirl-

winds and disturbances of that nature are very liable to occur. The risk may be largely reduced by lowering the factor of safety to, say, 2, which in countries not troubled with snow, and where, thanks to the pure, dry atmosphere, oxidation scarcely exists, may be safely permitted.

Kite-flying in some countries is a great cause of trouble, and contacts through the strings pulling the wires together are of frequent occurrence. When lines pass through villages addicted to this pastime it is well worth while reducing the dip to the minimum, in order to prevent this to a great measure, it being probably cheaper to renew all wires as soon as they become so much weakened as to break, rather than keep a large staff of linemen or incur the inconvenience of numerous interruptions.

These remarks are meant to suggest the importance of considering every individual telegraph line, of exceptional characteristics, on its own merits and not blindly assuming that a rule made for the United Kingdom is necessarily applicable to other parts of the world.

Chile.

May 4th, 1911.

A Legal Query.

Your correspondent "Inquirer" will be interested in the case of Tolhurst *v.* Association of Portland Cement Manufacturers (1903 A.C. 414). In this case a precisely opposite decision was given.

Apparently, therefore, the right to assign a contract depends to a large extent upon the nature of the contract and the circumstances under which it was originally placed.

A. C. Tappenden.

Kew, *June 2nd*, 1911.

Arc Lamp Suspensions.

With regard to the indictment of arc lamp suspensions by Mr. S. Lees in your current issue, we cannot agree that the statements therein are correct, especially as including what he is pleased to call "so-called high-class make arc lamps."

We would ask of you the favour to mention that during the many years we have made lamps we have never had any trouble with the suspension. We do not use an earthenware bobbin and an odd split pin, and we do not imagine that any other first-class makers do so either. As far as we are concerned, we use a $\frac{3}{8}$-in. bronze pin suitable for a substantial insulator, secured by split pins at both ends, and we use a permanently fixed and substantial shackle, which cannot wear, oxidise or get loose, as suggested. As a matter of fact, we do not know of any such weak arrangements as Mr. Lees suggests being in use on any important street lighting work.

The arrangement with the special strain insulators which he sketches at the end has been frequently used. It adds, in our opinion, unnecessarily to the length and expense of the attachment.

For **The Gilbert Arc Lamp Co., Ltd.**
C. GILBERT, *Director.*

Chingford, *June 2nd*, 1911.

AN ELECTRICAL OMNIBUS LINE WITH OVERHEAD SUPPLY.

Two railless traction lines have recently been opened in Bremen, and we take the following particulars of them from the *Elektrotechnische Zeitschrift*:—

Both lines are about two miles in length, and the distance is covered in 12 minutes, the maximum speed attained being 15½ miles per hour. One line has five stopping places, and the cars follow one another at 1-hour intervals, whilst the other line has seven stopping places and a 15-minute service. At present one omnibus only is running on the first line, and three on the second, with a spare car kept in reserve in each case. The charge for either journey is 10 pfennig (nearly 1¼d.), with a reduction on packets of 24 tickets and for school children.

The cars are of the ordinary motor-'bus type, with inside seating only, as can be seen from fig. 1. The overall length is 21 ft., height 10½ ft., and width 7 ft. The wheel base is 13 ft. There is

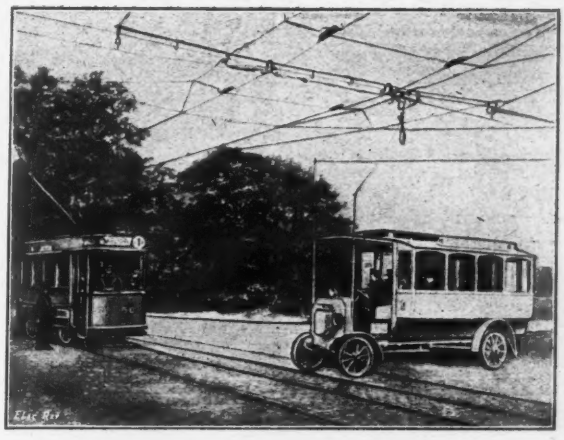


FIG. 1.—RAILLESS CARS AT BREMEN.

seating accommodation for 20 passengers, and the cars weigh 3·2 tons when empty and 4·7 tons when full. The electrical equipment of the cars consists of a single series-wound D.C. motor set axially in the centre of the car and geared to the back axle. It

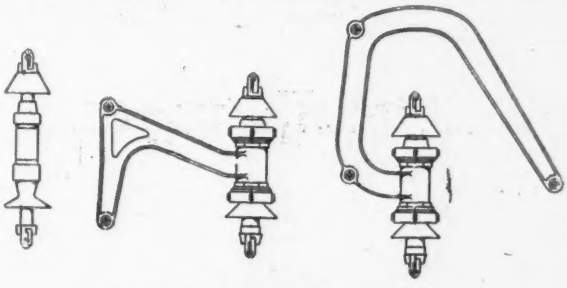


FIG. 2.—SUPPORTS AND DISTANCE PIECES.

has a normal rating of 18 H.P. and a maximum rating of 35 H.P. at 650 R.P.M.

The controller is of the ordinary drum type with magnetic blow-out, and has five running steps and two braking ones. It is inter-

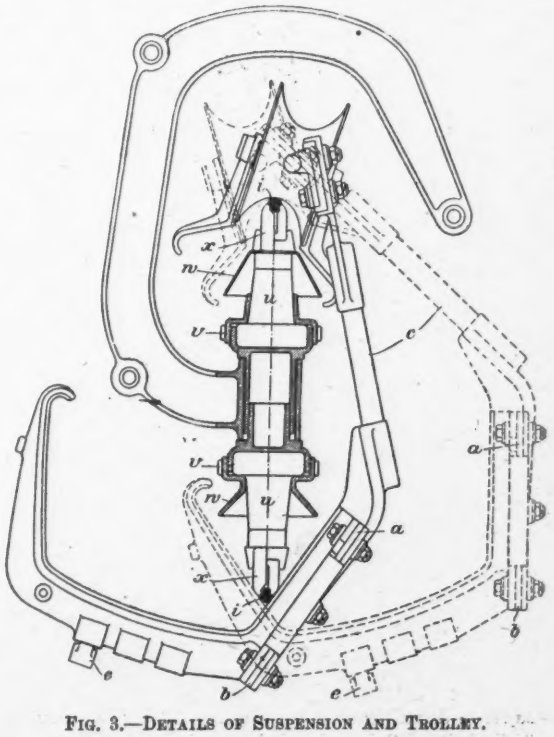


FIG. 3.—DETAILS OF SUSPENSION AND TROLLEY.

locked with the two foot brakes in such a way that, putting either of these on automatically cuts off the supply of current, and keeps it off until the brake has been released and the controller has been turned back into the starting position. Some of the necessary

speed variation is effected by coupling the motor field coils in parallel and in series, and the rest by series resistance.

One of the most interesting points about these lines is the method adopted for collecting the current from the overhead wires. The two wires are arranged with the negative vertically over the positive, instead of side by side. This simplifies the overhead construction and the collector, and, at the same time, improves the general appearance—especially as only the one pair of wires is provided for cars travelling in both directions. Cars meeting one another on the road have, consequently, to stop and interchange their collectors; but as this only involves opening a plug connection, it only causes a delay of from 12 to 15 sec. The overhead lines are of profile wire 63 sq. mm. in section, and are set 11 in. apart vertically. They are suspended at intervals of from 88 to 98 ft., with additional distance pieces at about 30 ft. intervals.

The various types of supports and the distance pieces are shown in fig. 2, whilst fig. 3 shows one of the suspensions in more detail, together with the current-collecting gear in its two extreme positions. The insulated bolts *w* carry the clamps *x* for the wire *i*, and the whole is supported in the C-shaped forging, which is provided with three lugs for the suspension wires. These wires are attached to the poles through insulators, so that the usual double insulation is provided. The negative wire is earthed every 1,000 metres, and, being the upper wire, it forms a certain protection for broken telephone wires, should these fall across the line. The positive line is provided with lightning arresters at 1,000-metre intervals.

The current collector is a combination of a trolley wheel collector and a bow collector, as will be seen from fig. 4. The collector for this work must be light and yet very flexible to side pulls, so as to avoid straining the wires unduly when the car has to move from side to side of the road to pass other vehicles. Also the wire connecting the collector to the car must be very flexible and must

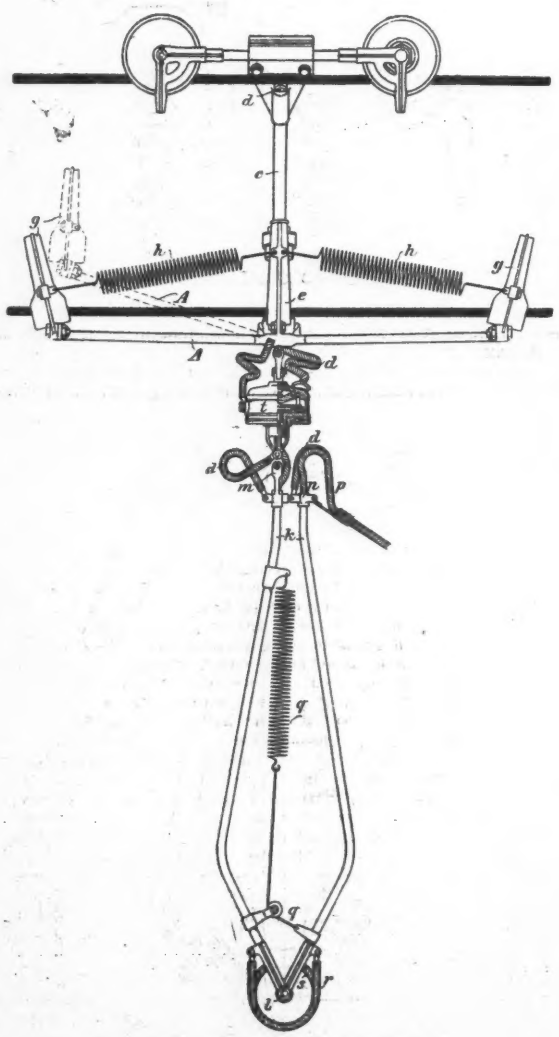


FIG. 4.—CURRENT COLLECTOR.

adjust its length automatically to meet the varying conditions, it must also be elastically attached to the collector so as to avoid overrunning at starting and stopping. To meet the conditions, the design shown was selected. The two trolley wheels at the top are 12 in. apart, and are carried on a *c* shaped arm which also carries the aluminium bow collectors for the lower wire, the two collectors being insulated from one another at *a* and *b*. The central carrier *e* (fig. 3 and 4) has two 11-in. hinged arms attached to it which carry the two aluminium bows *g* at their ends. The springs *h* exert a pressure of about 3½ lb. against the wire, and they allow the bows a limited upward and downward motion of 6 in. Fig. 3 shows how the whole collector is free to move a considerable distance from side to side without danger of damage. This motion not only prevents sideway strain on the lower wire, but also enables the aluminium bows to wear all over uniformly instead of in grooves.

The weight of this collector is 12 lb. In order to ensure smooth running and freedom from jerkiness, the collector is connected to

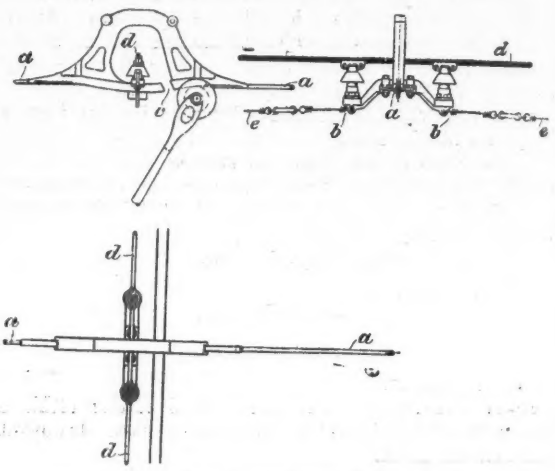


FIG. 5.—LINE CROSSING.

the cable from the car through a pair of 2-ft. hinged steel tubes *k* (fig. 4). The end of one tube *m* is connected to the collector through flexible cables *d*, and a double-pole swivelling contact maker *t*, whilst the other end *n* is connected to the car through the double collecting cable *p*, and a cord to take the strain. The hinged tubes are normally closed together under the action of the spring *q*, but when the car starts, turns, &c., the arms open more or less, and prevent shocks being transmitted to the collector itself. The collecting cables pass down an upright arm on the top of the car to a spring-controlled cable drum, which keeps the cable taut, and from which the current is conveyed to the motor through rubbing contacts. The whole arrangement has been found quite satisfactory in practice.

In conclusion, mention may be made of the method adopted for the crossing of a double track tramway line by the railless line at one point. This crossing is shown in fig. 1. In order to facilitate matters, all the lines are made dead for a radius of 4 metres from the crossing point by the insertion of ordinary section insulators in the case of the tramway lines, and by the interruption and insulation of the ends of the positive line at *e* (fig. 5) in the case of the railless line. The ends of the + line *e* are attached through insulators at *b* to the cross piece of the tramline *a*. A small gap, 1¼ in. wide, is left in the cross piece at *c* (fig. 5), through which the arm of the C-shaped railless collector can pass.

The 4-metre radius gap at the crossing place has normally to be got over without current, but if, by accident, a car should stop on the dead section, it is only necessary for the driver to draw the collector by hand either forward or backward on to the live portion of the line in order to obtain a supply again.

SLOW ALTERATION AND SPONTANEOUS COMBUSTION OF COAL EXPOSED TO AIR.*

IT has been suggested in the past that only pyritic coals, or those coming from "fiery" mines, are subject to alteration on exposure to air. Actually, however, all coals suffer a very characteristic oxidation in air, the ultimate result being spontaneous combustion, attended by more or less serious damage and loss. A detailed examination of the sequence of atmospheric influences on coal is, therefore, of great practical importance.

The process of *slow alteration* which first occurs is divisible into several clearly-defined stages:—

(*a*) The physical state of the coal is altered. Surface oxidation causes minute fissures which rapidly extend right through the lumps, thus the size of the sound pieces continually decreases.

(*b*) A change of weight occurs in three stages:—(1) Loss by escape of moisture and occluded methane; (2) Gain by surface oxidation; (3) Loss by escape of hydrocarbons formed by the partial decomposition of the coal.

Stages I and II occupy more or less time, according to the exact state and nature of the coal, but spontaneous combustion rapidly follows on Stage III.

* M. Lécrivain—"La Revue générale de Chimie pure et appliquée"; also "Le Génie Civil," 1911; page 131.

(*c*) A loss of calorific power (see Curve B B, fig. 1) and a deterioration of lighting and caking values follow the escape of gases from the coal. If the carbon content of the latter be low and the atmospheric temperature high, this loss of gas is very rapid and may easily exceed 30 per cent. in one month's exposure.

(*d*) The available by-products are diminished, and the quality of the coke deteriorates. The quantity of ammonia salts recoverable may decrease by 50 per cent. during three or four months (see Curve A A, fig. 1), and M. Fayol finds that Commentry coal gives a good metallurgical coke when freshly mined, but will no longer do so if exposed to the air for six months or so.

Spontaneous combustion is mainly due to the combined action of atmospheric moisture and oxygen. Moisture favours cleavage of the coal, and thus facilitates its oxidation; the resultant emission

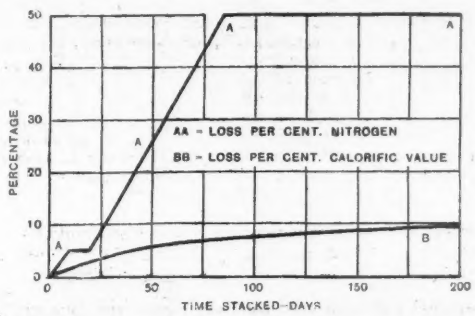


FIG. 1.—DETERIORATION OF COAL.

of heat and elevation of temperature then becomes progressively more rapid. Beds of coal-dust naturally heat more rapidly than stacks of lumps; stacks 13 ft. or more in height are especially liable to ignite spontaneously, and the oilier the coal and the greater the percentage of smalls, the greater the risk. Foreign matter, other than pyrites, has little influence on the fire risk.

Coal stacked in the open air is bound to deteriorate, but the fire risk may be made low by building only low banks. Storage under water is the best and safest procedure, and the first industrial application of this method is to be found in the 10,000-ton "drowned" magazine, built by the Western Electric Co., at Chicago, in 1902.

The causes of subterranean fires in coal mines are not yet thoroughly understood. The best means of fighting such conflagrations is to seal the mine, thus preventing access of oxygen, meanwhile cooling the gases and the incandescent masses of fuel by water jets.

ELECTRICAL PUBLICITY.

IN our last issue we mentioned the holding of the first annual conference of the Electric Supply Publicity Committee last week, the chairman, Mr. H. B. Renwick, presiding.

A summary of the meeting has now come to hand, from which we gather that the chairman reviewed the work of the last 12 months, and the prospects for the ensuing year were discussed.

We notice that the chairman claims the Committee as a particularly representative one, and it certainly is so as regards London and vicinity, but the provincial representation—especially of the larger undertakings—seems to be sadly lacking. It cannot be said either that provincial attendances at the meeting were any too numerous.

Successive issues of publicity literature have been made at frequent intervals throughout the year, comprising posters, showcards, booklets, pamphlets, circulars, folders, leaflets, mail-cards, postcards, and adhesive labels, covering practically the whole of the field of electric supply. Further, the issues were arranged so as to be appropriate to the various seasons of the year.

The total sales during the year numbered nearly one million and a half.

The Committee has also done signal services in connection with the newspapers, in correcting various erroneous reports which were given currency to in the Press in regard to the causes of fires.

Newspaper advertising has also been done to a fair extent, and there is hope that in the forthcoming year this will be carried on on a much larger and more comprehensive scale.

The Chairman upheld the necessity of a strenuous and systematic publicity campaign as preparing the way for, and supplementary to, personal canvassing. The universal use of electricity for lighting, power, and the many various domestic uses, could only be attained by continuous appeal.

This was especially a case for concerted action; a wide popularity was only possible through the cumulative effect of all undertakings combining to push simultaneously in one direction.

Mr. W. A. Vignoles, of Great Grimsby, spoke strongly in support of a systematic advertising campaign, and of the considerable results which he had experienced in his own area. He thought that the time had now come when electric cooking should be energetically pushed.

Mr. H. R. Burnett, of Barrow-in-Furness, thought that the extension of the Committee to include an Information Bureau would be a good thing, and would be of very great use to everybody all over the world.

Mr. A. H. Shaw, of Ilford, suggested that the Committee should, in the coming year, issue large-sized posters.

Mr. A. Cramb, of Croydon, suggested that it would be very useful to have some arrangement for the registration of canvassers to ensure being able to get hold of good men as representatives; and Col. Hopkins, St. Marylebone, thought that competitive prizes should be offered for designs for posters, &c.

The Committee has made a further issue of literature appropriate to the season, and with temperatures round 80° in the shade, the breezy electric fan poster and the six-page booklet illustrating fans of all types for all purposes, will be welcomed by supplier and consumer alike.

The issue also includes an ironing folder and a circular on electric signs. Other leaflets deal with electric cooking and heating, the safety of the electric light, &c., and supplement the very wide field already covered in this way.

NEW ELECTRICAL DEVICES, FITTINGS AND PLANT.

New Switch for Metallic-Filament Lamps.

THE great impetus which the high-candle-power metallic-filament lamp has given to the electric lighting of streets and public buildings has brought into prominence the importance from an economic point of view of the life of these comparatively costly lamps; whereas with the old carbon filament having a normal life of 800 hours at usual rates the cost of lamp renewals approximated to 5 per cent. of the total spent on energy and renewals, with the high-candle-power tungsten lamp this figure has risen in some cases to 25 per cent., making any means of prolonging the life of the lamp of much more importance than formerly.

Attention has frequently been drawn to a peculiar result of the relation between temperature and resistance in metallic filaments; owing to the resistance when cold being much less than when hot, on switching-on metallic lamps the instantaneous value of the current may be as much as eight times its normal running value, and there is a considerable amount of experimental evidence to show that this "overshooting," which is sometimes quite noticeable

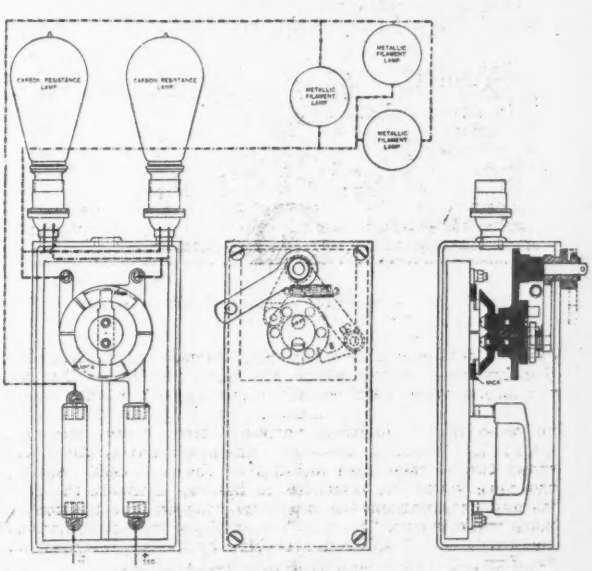


FIG. 1.—DETAILS OF SWITCH FOR METALLIC-FILAMENT LAMPS.

to the eye, has an injurious effect on the filaments, producing strains, particularly at the points of junction of the filament and the leading-in wires. The obvious remedy is, to switch the lamps on gradually through some form of current limiter or resistance; apparently where groups of lamps are used for street lighting, public buildings or large shops, it becomes worth while to provide the comparatively simple arrangement necessary, and it is estimated that where lamps or groups of lamps of 300 to 400 watts capacity can be controlled by one switch the cost of the device is justified. In applying a resistance for this purpose, advantage has been taken of the contrary temperature characteristics of the carbon and the metallic lamp, the current limiter taking the form of a two-way switch with a carbon lamp which is put in series with the metallic lamps for a short interval at switching on; the size and capacity of the carbon filament are selected so

that it is heated to whiteness, the result being that as the resistance of the carbon lamp drops that of the metal filament rises, the two heating up together, and the rush of current is checked very considerably by their combined action.

This arrangement has been provisionally protected, and is being put upon the market in a practical form for street lighting by MESSRS. V. G. MIDDLETON & CO., of Westminster. It consists of a waterproof switch and fuse with two contacts and a mechanical device whereby the switchman is obliged to pause for a short period on the first or ballast contact, before switching over finally and leaving the metallic lamp or lamps across the full pressure of supply.

As shown in the accompanying illustrations (page 911), the switch is operated by a ratchet, and rotates in a clockwise direction. The first movement of the ratchet puts the carbon resistance lamps in series with the metallic lamps to be switched on; the second movement puts the metal lamps direct across the supply pressure; the third brings the carbon resistance lamps into series again, and the fourth disconnects all the lamps. Thus the switching on and off is gradual, the ratchet action ensuring a short time interval between the first connection and the putting of the lamps across full pressure. During this interval warming-up and resistance increase takes place in the metal filaments.

The absence of the "overshoot" effect when switching on powerful lamps with this device is quite noticeable to the eye, and when switching off, the carbon resistance lamp is found to be over-incandesced for a moment by the drop in resistance of the metallic-filament lamps on cooling.

"Sirocco" Fans on Board Ship.

THE art of ventilation has probably received even more attention at the hands of the builders of large passenger vessels than has been devoted to it by architects of modern buildings. There is a larger number of persons on board in comparison to the space available than on land, involving, consequently, a larger volume of air than is usually required in buildings, and this air supply has to be distributed among innumerable cabins at such a low velocity as not to cause a draught, so easily noticeable in confined spaces. Provision must also be made for warming the air, as well as for its removal when vitiated. These considerations have led the modern shipbuilder to adopt mechanical ventilation with its small and

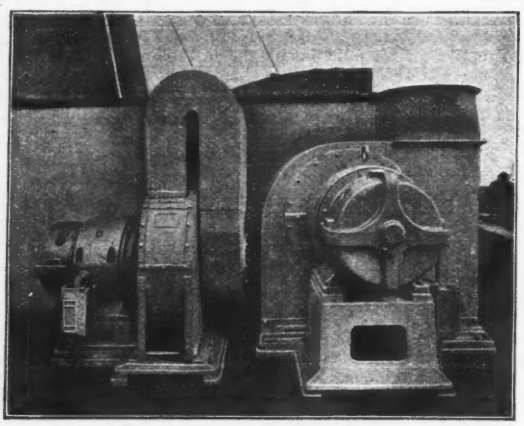


FIG. 2.—"SIROCCO" FANS ON THE *Olympic*.

compact units of comparatively high volumetric capacity, and on that luxurious floating palace, the White Star Liner *Olympic*—the largest vessel afloat—which starts on her maiden voyage on June 14th, MESSRS. HARLAND & WOLFF have installed no fewer than 75 electrically-driven "Sirocco" fans, measuring from 20 in. to 50 in. in diameter. The accompanying illustration shows two of these fans installed on the boat deck. Some of the fans, which are connected to heaters, distribute the fresh, warmed air throughout the ship; others are used for extraction purposes, while 12 large "Siroccos" are employed for the ventilation of the stokeholds. The fans were supplied by MESSRS. DAVIDSON AND CO., LTD., of the Sirocco Engineering Works, Belfast.

An Electric Baling Press.

The field hitherto occupied by hydraulic power for the operation of baling presses, and similar applications, has seemed so unassailable that we turn with interest to examine a solution of the problem, involving the direct application of an electric-motor drive, and entirely dispensing with the use of water.

The invention referred to (Hindle's Patent, No. 10,243/09) is, in one form, shown in the accompanying illustration, fig. 3, from which it will be noted that the lower table or platen is suspended from the upper platen by means of steel wire ropes. These are arranged in sets of four, one at each corner of the table. The end of each rope is anchored to the upper platen, thence passing round a number of sheaves, so that a purchase is obtained, the free ends of the rope being wound simultaneously on grooved winding drums, directly connected to the motor through suitable reduction gearing.

The motor is series wound, giving automatically a considerably higher speed when more lightly loaded, a characteristic which is ideal for the purpose in view. To operate the press, the motor is run in one direction to lift the table, and in the reverse direction to lower off, an important condition of the design being that the table must fall by gravity, when the wire rope is paid off the drums. As the material is compressed, the current through the motor gradually increases to a maximum corresponding to the total pressure

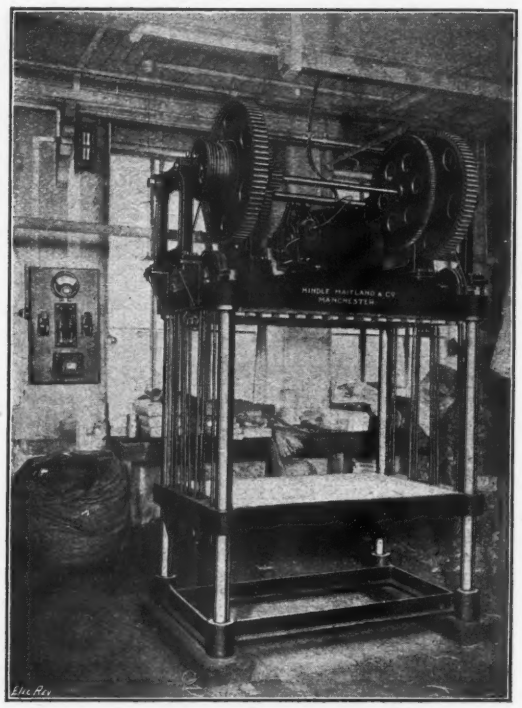


FIG. 3.—HINDLE'S ELECTRIC BALING PRESS.

required, whereupon the circuit is opened by means of duplicate circuit-breakers, and a self-acting brake on the motor spindle holds the load without any further expenditure of electrical energy.

In contradistinction to the hydraulic press, in which the upper platen is tied down to the cylinder by means of tie rods at the corners, and the table *thrust* upwards, the electric press involves no such strain on the corner pillars, which merely support the upper platen, and act as guides for the moving platen. The latter is forcibly *pulled* upwards by means of the steel wire ropes, over which the entire strain is equally distributed.

The power required is determined by the speed of the table at the point of maximum compression; for instance, in the case of a 100-ton press in which the final speed of the table is 6 in. per min., the duty to be performed would be 50 ft.-tons per min., equivalent to approximately 3½ H.P., which would necessitate a motor of 5¼ B.H.P., after allowing for losses in gearing, ropes, &c. The motor, obviously, can be very highly rated, for not only is the period of

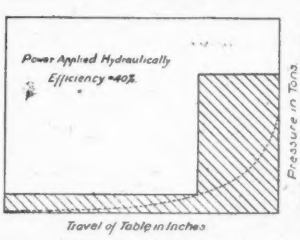


FIG. 4.

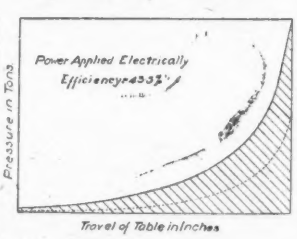


FIG. 5.

EFFICIENCY OF HYDRAULIC AND ELECTRIC PRESSES.

running very small in comparison to the period of rest, but the average load when running is only about 25 per cent. of the maximum power developed.

The resistance of various commercial products to pressure, of course, varies considerably. In textile goods, generally, very little resistance is offered during the major portion of the compression, which is simply a process of expelling air from the folds or interstices of the material. Only in the very last stage of the compression does the maximum pressure of the press come into operation.

In the hydraulic press, fig. 4, two pressures are available, the higher pressure being five times the primary pressure, and obtained by means of an intensifier having an assumed efficiency of 80 per cent. Excluding pumping losses, which are not allowed for, the overall efficiency is 40 per cent.

When the power is applied electrically, as in fig. 5, the motor demands power proportionate to the resistance to be overcome, consequently the two curves approximate to the same shape. In this

instance the motor losses are allowed for along with other friction losses, resulting in a total overall efficiency of 43·5 per cent.

As the cost of hydraulic energy varies from two to six times that of its electrical equivalent, the above comparison becomes very significant. It is further claimed that no special foundations, or deep excavations, are required, that each press is a complete unit in itself, that no auxiliary apparatus such as pumps, intensifiers, or accumulators are required, and that the control is extremely simple. Owing to the flexibility of the ropes, the large factor of safety provided for, and their extremely slow speed of travel, a long life is assured.

The press is being put on the market by MESSRS. HINDLE, MAITLAND & CO., of 100, Deansgate, Manchester.

Copeland's Patent Bindless Line Insulator.

MESSRS. JAMES MACINTYRE & CO., LTD., of Washington China Works, Burslem, have put on the market a patent bindless and practically unbreakable insulator. This insulator is made of the highest quality of ivory or brown English porcelain, and can be made to suit any voltage; the cover can be of porcelain or metal. For telephone or telegraph lines, covers of pressed steel are recommended, these being unbreakable, a very valuable consideration for public roads. Where aluminium wire is used, aluminium covers can be employed, as no other metal is suitable for use with aluminium wires. The insulator is claimed to be superior to others, being easily and more quickly fixed, and has the advantage

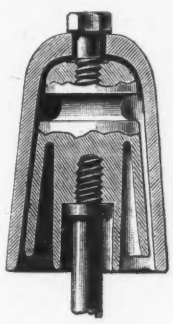


FIG. 6.—SECTION OF H.V. INSULATOR.

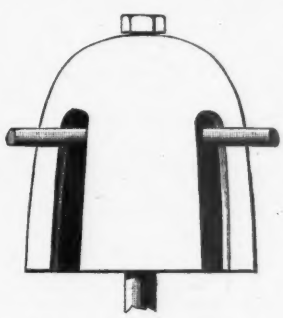


FIG. 7.—WIRE ATTACHED TO H.V. INSULATOR WITH PORCELAIN COVER.

that should the line wire break there is no fear of the wire slipping from the insulators. The insulator consists of two parts: the inner part is made of porcelain with a groove round the body for the wire to be laid in, while the outer cover or cap has two slots which pass over the wire or cable used. The insulator is screwed on the bolt, and fixed in position on the arm or bracket as usual. After the line wire has been drawn tight for some distance, it is placed in the groove of the insulator, and the cap or cover of the latter is dropped over it, the wire being guided between the slots until the cover rests on the top of the insulator. Then the tap bolt at the top is screwed down, and the wire is firmly fixed.

Edison Screw Adapter.

THE BENJAMIN ELECTRIC, LTD., of 1A, Rosebery Avenue, E.C., are introducing a new Edison screw attachment plug, or adapter, which has some features hitherto unknown to this market. It is claimed that this is the smallest Edison screw adapter on the market, being almost unnoticeable after screwing in the lampholder. An important feature is the "rotating sleeve" which

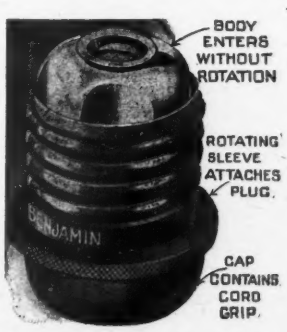


FIG. 8.—BENJAMIN EDISON SCREW ADAPTER.

allows the adapter to be screwed into the lampholder without twisting the flexible. A very strong cord grip is provided in the cap. It is said to be a high class and thoroughly dependable accessory and practically unbreakable. This adapter will appeal to those firms who supply heating devices, portable lamps, and the like, to Colonies and foreign countries where the Edison screw lamp is the standard.

"Tubolite" Metal-Filament Lamps.

For nearly three years the LINOLITE CO., of 25, Victoria Street, S.W., has used a 25-volt metal-filament lamp in connection with its system of "Tubolite" reflector fittings; it is now announced that similar lamps of 100 to 125 volts can be supplied, of 12 C.P., taking 1·5 watts per candle. These, of course, will greatly extend the sphere of utility of the system, and will enable installations at present equipped with 100-volt carbon-filament lamps to take full advantage of the economy of energy of the tungsten lamp.

Electrical Cooking Apparatus.

During the past few weeks MESSRS. BAXTER & CAUNTER, LTD., of 86, Charing Cross Road, W.C., have been holding demonstrations of electric cooking with the Vickers electric Eclipse oven, for which they are the London agents.

The Eclipse cooker is a substantially built apparatus, at first sight closely resembling the gas oven. The electric heating elements are placed on either side of the oven, being protected by suitably perforated cast-iron gates, which also serve the purpose of carrying the runners for the oven grids and shelves. These gates are removable, and can be cleaned and replaced without trouble. In the top portion of the cooker are provided two circular hot-plates, corresponding to ordinary gas burners, and one combined hot-plate and grill, each circular hot-plate being controlled by a three-heat turn switch, and the combined grill and hot-plate by an "on" and "off" switch. A ruby indicating lamp is provided to show when the cooker is on circuit, and to serve as a reminder to the user to turn off all switches (including the main switch controlling the cooker) when the cooker is not in use.

The heating elements consist of round or flat wire wound on mica strips, which have a life of 3,000 or 4,000 hours, and cost about 1s. 6d. each.

The demonstrations have shown that a 4½-lb. joint can be comfortably cooked in the hour, 20 minutes for heating the oven and 40 minutes for the actual cooking; at 1d. per unit, the cost of electricity amounts to 2d. The griller will cook a chop in 8 or 9 minutes, and a rasher in 4 minutes, and excellent bread and pastry were produced.

We believe these cookers are obtainable on hire-purchase and hiring terms through the various electric supply authorities.

LEGAL.

HUMPHREYS *v.* THE CITY OF LONDON ELECTRIC LIGHTING CO., LTD.

THIS case came before the Court of Appeal consisting of the Master of the Rolls and Lords Justices Buckley and Kennedy upon the appeal of the applicant from the award of the Judge of the City of London Court, under the Workmen's Compensation Act.

MR. BOXALL, K.C., in support of the appeal, said that the applicant was employed by the respondents as an electric fitter, and in November, 1908, he had an accident, his thumb being cut by an electric arc lamp, which resulted in several operations, and finally half his thumb was amputated, and he had lost the entire use of his right hand. For some time the applicant was permanently incapacitated from work, but at the time of the arbitration he had obtained employment with the respondents in a different capacity, and was now employed by them as a watchman, which involved day and night work. In his former employment the applicant's wages were 32s. 6d. a week for 50½ hours. As a watchman he had to work 68½ hours a week, and his wages were 25s. a week. Applicant's contention was that the Judge in the Court below should have made an award in his favour for 7s. 6d., the amount he had lost by reason of the accident, but the Judge only awarded him half that amount, He (counsel) contended that the applicant in the circumstances was entitled to an award of 7s. 6d.

Without calling upon counsel for the respondent company, their Lordships dismissed the appeal, holding that there was no point of law involved upon the appeal, and that they could not interfere with the finding of fact of the learned Judge in the Court below.

NATIONAL TELEPHONE CO., LTD., *v.* POSTMASTER-GENERAL.

BEFORE the Railway and Canal Commission (Mr. Justice A. T. Lawrence, the Hon. A. E. Gathorne-Hardy, and Sir James Woodhouse) the Attorney-General (Sir Rufus Isaacs, K.C.) mentioned the order made in the case of the National Telephone Co., Ltd., *v.* His Majesty's Postmaster-General. He suggested that the order as drawn up should be varied in several minor particulars so as to make it perfectly clear, when the matter came before the Court of Appeal, exactly what the judgment of the Commission dealt with, especially with regard to the various areas.

MR. DANCKWERTS, K.C., for the Telephone Co., thought the order as drawn sufficiently expressed the judgment of the Court, and MR. JUSTICE LAWRENCE said that as the plaintiffs objected the order must go as originally given out.

Upon the application of the Attorney-General, the Court of Appeal, consisting of the Master of the Rolls and Lords Justices Buckley and Kennedy, on Thursday, June 1st, decided to expedite the hearing of the appeal which has been entered in this case from the decision of the Railway and Canal Commission Court, and fixed the hearing of the appeal from June 14th and following days.

HULTON COLLIERY EXPLOSION.

The report of Mr. R. A. S. Redmayne, H.M. Chief Inspector of Mines, on the explosion which occurred at No. 3 Bank Pit of the Hulton Colliery, in December last, was issued last week. The Inspector came to the conclusion that gas coming from a fall of coal was "ignited by a safety lamp becoming overheated, falling through the gas, or by its being damaged by the fall of stone." The explosion was carried by the dust through the mine. Reviewing the risks attending the use of the "so-called safety lamp," which is "only safe under certain conditions," the Inspector says: "It would seem as if the time had come when something safer may be used. The electric lamp, in that it provides a light which is absolutely shut off from the atmosphere, would seem to present possibilities in this respect," and he suggests that the possibility of the replacement, or partial displacement, of the gauze lamp in fiery mines by the electric lamp, providing gauze lamps only for the purpose of detecting the presence of gas, is a subject worthy of the most serious consideration of mining engineers and others connected with the working of gassy collieries.

"There are already in use 2,155 miners' electric portable hand lamps; and at Murton Colliery, in the County of Durham, miners' electric hand-lamps have been in use since the year 1897, when 500 were introduced; these have since been increased to 1,840. The disadvantages that have militated against their extensive use have been:—

1. Their great weight.
2. Trouble in respect of the batteries.
3. Greater first cost and greater working costs.
4. The detection of the presence of gas by them is impossible.

The advantages in respect of these lamps are:—

1. The risk of ignition of an explosive mixture can be eliminated.

2. The lamps give a better light than that afforded by 'safety' lamps, and hence allow of a better examination of the roof and sides."

Regarding the electrical equipment of the colliery, the Inspector states that the plant "was, generally speaking, mechanically and electrically strong, properly erected and well maintained." Although he does not believe that any sparking which may have occurred at the conveyor switch-box had any bearing on the explosion, he thinks it unwise to use electricity at the coal face in a gassy mine, such as this was, and under the new Rules it would not be permitted. He is perfectly satisfied that the explosion did not originate in the No. 1 North Plodder (where the electrical conveyor was installed), and that the use of electricity in the mine had no bearing on the disaster. Armoured cables were in use throughout the mine, and satisfactorily resisted the effects of the explosive blast, heat and heavy falls of ground, being in every case found mechanically and electrically perfect. No breach of the Electricity Special Rules can be alleged against the management. The conclusion drawn by Mr. Redmayne from the evidence submitted at the inquiry, as regards the electrical plant, is the importance of its proper supervision.

A daily report as to the condition of the electrical apparatus was made, but it is not sufficient to say that the condition of the apparatus was found to be "good"; the report must be detailed, the level of oil in oil-immersed switches should be verified, the continuity of cable armouring should be ensured; such an inspection and report should clearly be made by a competent man. The safety of the apparatus depends upon constant supervision and efficient maintenance.

SOME RECENT TELEPHONE DECISIONS.

[FROM OUR LEGAL CONTRIBUTOR.]

Questions between the Postmaster-General and the local authorities in relation to the stretching of telephone wires across streets and highways are constantly arising at the present time. The sympathy of the public will doubtless be with the Postmaster-General in these disputes. Telephones long since came to stay. To have an instrument in the office is essential to the business man; and to have it at home is considered necessary by many a householder. Æsthetic objections may have been raised some years ago to overhead wires, but the voice of the objector is now scarcely heard in the land. In all these circumstances it is not easy to understand why the local authorities should try to put difficulties in the way of the Postmaster-General when he is endeavouring to develop a system which is useful and advantageous to the public.

To understand the position it is necessary to glance at Sec. 12 of the Telegraph Act, 1863, which provides that "The company shall not place a telegraph over, along, or across a street or public road, or a post in or upon a street or public road, except with the consent of the body having the control of such street or public road; and where a public road passes through or by the side of any park or pleasure grounds, and where a public road crosses by means of a bridge or viaduct, or abuts on any ornamental water belonging to any park or pleasure grounds, and where a public road crosses or abuts on a private drive through any park or pleasure grounds, or to any mansion, the company shall not, without, or otherwise than in accordance with, the consent of the owner, lessee, and occupier of such park, pleasure grounds, or mansion, place any work above ground on such public road." "The company" in this section now includes, of course, the Postmaster-General when operating telephones.

It was not until 1878 that machinery was provided whereby the differences between the Postmaster-General and the local authority could be settled. It was then provided (by Sec. 4 of the Telegraph Act, 1878) "that where any difference arises under this Act or 'The Telegraph Act, 1863,' between the Postmaster-General, and anybody or person having any power, jurisdiction, or control over, or relating to, a street or public road, such difference shall in England, or Wales, and Ireland, be referred to the police or stipendiary magistrate having jurisdiction within the district in which the difference has arisen, or if there be no such magistrate, then to the judge of the county court having jurisdiction within such district . . . . ." From the decision of the magistrate or county court judge, an appeal lies to the Railway and Canal Commissioners.

In the cases which have come before them from time to time, the Commissioners have laid it down that they will not enunciate any principle upon which they will or will not force a local authority to give consent. Some ideas may, however, be gathered from the consideration. The alternative to overhead wires being underground wires, which are usually much more expensive, the Postmaster-General naturally seeks for the consent of the local authority as often as he can. In the case of the Postmaster-General *v.* Tottenham Urban District Council, 74 J.P., 434, which was decided last year, a local authority were held to be justified in withholding their consent under Sec. 12 of the Telegraph Act, 1863, to the placing by the Postmaster-General of overhead telegraphic wires in a street where they had themselves, for the benefit of the neighbourhood, converted their own overhead lines into underground lines at a considerable cost, and the economy which would be effected by the Postmaster-General by not placing the lines underground would be comparatively trifling, although overhead lines would neither be unsafe nor unsuitable as regards the amenities of the street.

Another case, which was decided at a later date last year, involved the decision of certain points of more general application. We refer to Croydon Corporation *v.* Postmaster-General (74 J.P., 424), where it was held that, in view of the difference in the cost of overhead and underground wires, the Corporation of a town which prides itself on its residential character, is not justified in requiring, merely on æsthetic grounds, the extra expense to be incurred. In 1908 the Postmaster-General desired to erect overhead telegraph wires in the Borough of Croydon. The Corporation refused to consent to the wires being placed overhead, although they gave their consent to such wires being underground. The difference in cost between the two systems amounted to £726. The Postmaster-General having already spent £65,000 on underground, as against £1,800 on overhead, wires in the borough, came to the conclusion that he had done enough. A difference having thus arisen between the Postmaster-General and the Corporation, the matter came before the County Court. The grounds of objection raised by the Corporation to overhead wires were five in number. They asserted that (1) that such wires tended to lower the letting value and depreciate the letting value of houses in the roads where they were erected; (2) that they disfigured the roads in which they were erected; (3) that they were a source of danger in times of storm and tempest; (4) that they were a nuisance and a disturber to domestic peace and comfort by reason of the noise caused by the vibration of the wires; (5) that they were obstructions to the traffic, and dangerous on that account. The County Court Judge having found against the Corporation notwithstanding all these objections, the Corporation appealed to the Railway

Commissioners. It was held that no good reason existed for having nothing but underground wires in Croydon; that the difference in cost between the underground and overhead systems being so enormous—about 355 per cent.—if the argument for the Corporation were acceded to, the telephone system in the country would be so cramped as to limit its general utility, or the taxpayers would have to bear the amenities of the borough of Croydon. It was further held that the Postmaster-General might adopt the overhead system, unless the Corporation gave notice within a certain time that they would bear the extra cost of laying wires underground in any street.

While the dispute between the parties generally resolved itself into a case of "underground *v.* overhead," there have been cases where other points have been considered. For instance, in *Re* Postmaster-General *v.* Woolwich Borough Council (1908) 72 J.P. 186. There were two matters of dispute in this case, one was as to whether in a certain street the telegraph poles should be of painted wood or iron—the former being much cheaper. The difference in cost was that between £225 and £75. The question was wholly one of damage to the amenity, but as the street in question was mainly composed of artisan's dwellings, the Commissioners did not think the injury was sufficient to justify them in imposing the extra expense on the Postmaster-General.

To summarise the result of the decisions on this important matter, we cannot do better than quote the following passage from a leading article which recently appeared in the *Justice of the Peace*.

"The only principle to be gathered from these cases is that the local authority in exercising their discretion must do so reasonably. They must take into consideration that the Postmaster-General is a public officer, whose duty is to render a public service, and to render it at a reasonable cost. He cannot do so unless he is met reasonably. A local authority, in coming to a conclusion, must, therefore, adopt an unprejudiced attitude, and endeavour to decide impartially between the æsthetic appearance of their borough on the one hand, and, on the other, the benefit to their ratepayers from having a telephone system at a moderate price. At the same time, it would appear that, if the erection of overhead wires would substantially injure the value of the property in the street, or cause an appreciable obstruction, the authority would be justified in insisting that the underground system be adopted."

BUSINESS NOTES.

Worthington Contracts. — Amongst recent orders obtained by the WORTHINGTON PUMP CO., LTD., of London and Newark-on-Trent, are the following:—

Repeat order for four natural draught cooling towers each capable of cooling 125,000 gallons per hour, for the Birmingham Corporation power station, like those already installed.

Two Worthington natural draught cooling towers for Continental service.

Repeat order for a surface condensing outfit for 42,000 lb. of steam per hour with 27-in. vacuum, through the B.T.-H. Co., of Rugby, for the Coventry electric light station.

Surface condensing outfit for 40,000 lb. of steam per hour with a vacuum of 28½ in. through the B.T.-H. Co. for the Lancashire Power Co.

Surface-condensing outfit for 45,300 lb. of steam per hour with 28-in. vacuum, through the Machinenfabrik Oerlikon for the Dublin Electric Light Works.

Surface-condensing outfit for 26,300 lb. of steam per hour, with 27½-in. vacuum, through the B.T.-H. Co., for the Halifax electric light station.

The above condensing outfits are all in accordance with steam turbine service.

Worthington centrifugal pumping installation, consisting of seven high lift and two low lift centrifugal pumps, electrically-driven, for supplying water to the outlying districts of Madrid.

Centrifugal sewage pumping plant consisting of four vertical centrifugal pumps, electrically-driven, and two horizontal centrifugals with steam engines and condensers, for South America.

New Works in London.—In our illustrated article on Coronation Electrical Illuminations allusion is made to the new works that have been opened by MESSRS. DUNCAN WATSON & CO. We may here give a few details concerning these and their equipment. The premises are situate at 31, Great Titchfield Street, and comprise a building of five floors with a gateway entrance. At the front is a modern dwelling house replete with the latest fittings, including electric lighting. The house is occupied by one of the firm's resident managers, who is, therefore, on the spot by night and by day when required.

There is provided at the back of the premises a large fireproof iron staircase, which forms a convenient means of access to and egress from the different floors. There is also an internal staircase and a passenger and goods lift.

The top floor being the best lighted, is used for workshops, one-half equipped with wood-working machinery and carpenters' shop, and the other fitted out as a machine shop, with lathes in various sizes, vices, power saws, grind-stone, emery grinders, buffs, power-driven drills in various sizes, brazing forges and tool lockers. This machine shop is driven by one large motor. There is also provided a dynamo, motor-driven, which supplies current at different voltages for testing purposes to a central switchboard on which are mounted rheostats and various testing appliances. The workshop generally is well arranged and excellently lighted and ventilated.

In regard to the wood-working machinery and carpenters' shop, the two most interesting machines are a power-driven fret saw, in the centre of a large table, driven by a separate motor concealed underneath. Mounted on beams above is a small motor-driven centrifugal blower, which gives sufficient power to blow the sawdust from the pencil marks when the saw is in action. This fret saw can cut out a large number of devices at one time, and it was doing such work on Coronation orders at the time of our visit.

The next is a motor-driven centre bit, which, running at a very high speed, drills the required holes with enormous rapidity. This bit can do the work of a dozen men, and does it with perfect accuracy.

The carpenters' benches are provided with the latest vices and appliances to make the work of the carpenter as easy as possible. This shop is also well lighted and ventilated.

On the other floors there are to be found carefully-arranged departments embracing nearly all the requirements which the average user of electricity may find necessary, every kind of metal-filament lamp, carbons, cables, conduits, and tools of every description.

A furnace in the basement provides the heating for the whole premises, and no expense has been spared to make the building as perfect and complete as possible.

Holidays.—THE "OMEGA" ELECTRIC LAMP CO., LTD., of Palace Works, Hammersmith, announce that their factory will be closed from Thursday, June 22nd, to Saturday, July 1st, inclusive, for their annual holiday, and orders cannot be executed during that time.

Catalogues and Lists.—THE ADNIL ELECTRIC CO., LTD., Artillery Lane, London, E.C.—List AE58, giving illustrated particulars and prices of several types of voltmeters and ammeters (moving iron type) with air-damping device.

MESSRS. W. T. HENLEY'S TELEGRAPH WORKS CO., LTD., Blomfield Street, London Wall, E.C.—Twelve-page list, giving particulars and plainly tabulated prices of Henley's flexibles. This is the first time the company have issued a separate list of flexibles, such information being usually embodied in their list of vulcanised india-rubber cables. The present separate list is in addition to the latter publication, but the same information will be included in the larger list which is now preparing for issue. The pamphlet before us contains several new classes of flexibles, including Home Office flexibles braided with specially durable hard core, which forms a protection which is claimed to be as hard as any metallic covering, and to obviate the necessity for earthing the protective covering. Copies of the list can be obtained on application.

MESSRS. BRUCE PEEBLES & CO., LTD., Edinburgh.—New 24-page pamphlet in their standard style and size, containing a full descriptive account, with much tabulated data, also weights and dimensions, of the Peebles "D" type A.C. polyphase induction motors of large size for from 100 to 6,600 volts. Part I relates to open bedplate type machines, arranged with two or three bearings, and Part II to end hood pedestal type machines specially suited for direct coupling to pumps, fans, &c.

MR. R. WOLF, Norfolk House, Laurence Pountney Hill, London, E.C.—New charmingly illustrated catalogue of 70 pages, describing the firm's latest types of superheated steam locomobiles, which are made in various types and sizes up to 800 H.P. A couple of double-page views very effectively show the works at Magdeburg-Buckau, and a full general description is given of the locomobiles, with numerous half-tone exterior and line sectional views. Dimensions, capacities, code-words, and so forth, are all given in tabular form. We understand that the firm guarantees a coal consumption of 1·2 lb. of coal per B.H.P. per hour and a steam consumption from 9·7 lb. of steam per B.H.P. per hour. Two of these locomobiles, each of 650 B.H.P., and each to drive direct-coupled a 400-KW. B.T.-H. alternator, have just been shipped to Rio de Janeiro for the emergency station at Nichteroy.

ST. HELENS CABLE AND RUBBER CO., LTD., Warrington.—Our numerous golfing readers will be interested in a handy "Condensed Golf" card that has been issued by this company giving "a few notes and time-honoured maxims" for players, compiled by the manager of the company and revised by Mr. John Ball. Readers interested can obtain copies of the card on application.

ALLGEMEINE ELEKTRICITATS GESELLSCHAFT, Berlin.—Folder relating to the company's mercury-vapour rectifiers for kinematographs.

MESSRS. G.m.b. H. CLASSEN & CO., Barbarossastrasse, 16, Berlin W. 30.—Brochure containing an essay by F. M. Feldhaus on the "Historical Development of the Art of Soldering," from the earliest times, showing that it was known and practised by the ancient Egyptians, as well as by the Romans and other nations. Many quaint old pictures are reproduced, in some of which the blow-pipe is seen in use. The latter part of the brochure deals with the "Fludor" soldering materials, of which a price-list is also given. Copies of the booklet (in German) may be obtained gratis from the firm.

E

THE BRITISH THOMSON-HOUSTON CO., LTD., Rugby. — New price-list, No. 298, containing a brief description with illustration and prices, of their new type of "Calorite" electric tea kettle, the special feature of which is the heating element, which consists of Calorite wire wound on a mica former enclosed between two cast-iron plates. As Calorite withstands a temperature up to 2,800° F., it is claimed that the heating element is thermally indestructible under service conditions. Prices of accessories are also given. Folding price list of C.C. and A.C. B.T.-H. fan motors for wall and desk service.

MESSRS. SIEMENS BROS. & CO., LTD., Caxton House, Westminster, S.W.—Supplement No. 2 of catalogue No. 531 containing a brief, but fully illustrated description of non-incrusting zincs for primary cells, including their registered taper Leclanché zinc; reprint No. 537A (16 pages) containing full notes regarding their Siemens-Obach dry cells and dry-cell batteries for ignition, and instructions for their use, with illustrations and prices. This reprint forms a section of the firm's forthcoming catalogue.

Lamp-Making at Nottingham.—The *Times* reports Mr. Ernest Jardine, M.P., as announcing his intention to start two new industries in Nottingham, one of which is "that of the making of incandescent filament lamps." "This is a trade requiring a light, delicate touch, and Mr. Jardine asserts that the manual skill to be found in Nottingham, inherited from generation to generation, warrants him in implanting that industry there."

Trade Announcements.—MESSRS. E. M. EVANS & SON, electric light and power engineers, have removed to new offices and showrooms at 1 and 5, Lever Street, Manchester. Telephone: "4,250 City." The firm has been in existence for 32 years.

THE GLOBE ELECTRIC CO., LTD., of 11, Farringdon Avenue, London, E.C., are now taking up the manufacture of signs, and for this and general business purposes they have taken two additional floors in the building already occupied by them.

For Sale.—The directors of the Palace Theatre, London, have for sale three loco type boilers, for Willans-Siemens 100-volt sets, feed-water heaters, pumps, &c. See our advertisement pages to-day.

Book Notices.—"The Brussels Exhibition Fire, with some Suggestions as to Safeguards at Future Temporary Exhibitions." 1911. London: The British Fire Prevention Committee. Price 2s. 6d.

"Imperial Telegraphic Communication." By Charles Bright. 1911. London: P. S. King & Son. Price 3s. 6d. net.

"Bulletin Scientifique de l'Association des Elèves des Ecoles Speciales." May, 1911. Liége: *Imprimerie Moderne*. Price 75 cents.

Proceedings of the American Society of Civil Engineers." Vol. XXXVII, No. 5. May, 1911. New York: The Society.

"Science Abstracts." Vol. 14, Part 5. May 25th, 1911. Sections A and B. London: E. & F. N. Spon, Ltd. Price 1s. 6d. net each.

"Boletin de la Sociedad di Fomento Fabril." April, 1911. Santiago.

Bankruptcy Proceedings.—JOHN DENNIS CARLMARK, electrical engineer, 402, High Street, West Bromwich, Stafford. The public examination of the above debtor was held last week at the Law Courts, Lombard Street West, West Bromwich. The deficiency amounted to £390. The debtor stated that he was born at Stockholm and came to England 15 years ago, following the occupation of an electrical engineer with the Royal Niger Co., West Africa, with the Consolidated Telephone Co., and afterwards with the National Telephone Co. Then in 1899 he joined Mr. Richardson in partnership as the West Bromwich Electric Light and Power Co., neither having any capital. He first knew that they were going wrong about three years ago, and 12 months ago they dissolved partnership, with the object of reducing the drawings and enabling them to pull the business round. At the time of the dissolution there was an adverse balance of £280, and he paid Mr. Richardson £35 to go out of the business. He also had a personal liability of £80 caused through becoming guarantor for his brother-in-law, who was an undischarged bankrupt, so that when he took over the business there was a deficiency really of £415. His position was no worse than at the time of the dissolution, and he now managed the business. His wife claimed all the household furniture. The debtor attributed his failure to keen competition and bad trade in the business in which he was a partner until May, 1910. The case was ordered to stand adjourned because of the question of the Official Receiver's title to some of the furniture.

G. M. SELLICK, manufacturer of electrical accessories, Forest Gate.—Application for discharge to be heard June 27th at Carey Street.

E. F. JONES, plumber and electrical engineer, West Hartlepool.—First and final dividend, 10¾d. in the £, payable June 12th. (Brittain & Brittain, N.E. Bank Chambers, Stockton-on-Tees).

Dissolutions and Liquidations.—TELEWRITER SYNDICATE, LTD.—A meeting will be held at 3, London Wall Buildings, E.C., on July 4th, to hear an account of the winding-up from Mr. J. Craggs, the liquidator.

IMPROVED ELECTRIC TRACTION, LTD.—This company is winding up voluntarily, with Mr. H. M. Gowar, Birkbeck Bank Chambers, High Holborn, W.C., as liquidator. A meeting of creditors is called for June 15th. Creditors must send in the usual particulars by July 15th.

ARC LAMPS, LTD.—Creditors must send in the usual particulars to Messrs. H. B. Clark and G. E. Corfield, 3-5, Crown Court, E.C., the liquidators, by July 7th.

UXBRIDGE AND DISTRICT ELECTRIC SUPPLY CO., LTD.—June 20th is the last day for the receipt of proofs for dividend. Mr. H. de V. Brougham, liquidator, 33, Carey Street.

LIGHTING and POWER NOTES.

Algeria.—A new company has just been formed at Ain Temouchent (Oran) with a capital of £18,000 and the title La Societe Generale Algerienne de Production et de Distribution d'Energie Electrique, to establish a plant for the supply of electrical energy for lighting and power purposes in the district named.

Atherton.—Formal sanction has been received from the L.G.B. for the Council to borrow £2,867 for the purposes of its electric undertaking.

Bitton.—A scheme of electric light has been adopted for Bitton (Glos.), subject to the C.C. permitting the erection of standards on the main roads. Current will be supplied from the mill of Mr. C. King Smith, who will provide the poles and undertake the wiring.

Blackpool.—The T.C. has decided to supply free current for external illuminations for the Coronation celebrations.

Bradford.—At the Town Hall last week, a L.G.B. inquiry was conducted for the purpose of hearing an application by the Corporation for sanction to borrow £60,000 for carrying out extensions and improvements in electrical plant. Evidence was taken, in which it was stated that the amount was a provisional one, to be used from time to time as new undertakings were taken in hand. The Inspector (Mr. T. C. Elkin) will make his report in due course. There was no opposition.

Bridlington.—It was reported at the T.C. on the 31st ult. that the profit on the electricity works for the year amounted to £1,006, which is a record. The total profit earned by the undertaking since its establishment six years ago is £1,425.

Brighton.—The municipal electricity undertaking for the year ended March 31st last, yielded a net surplus revenue of £4,751, as against £6,251 in the previous year. The expenditure covers an item of £1,000 in settlement of the claims under the agreement with Mr. Arthur Wright, who has retired from the position of consulting engineer. The gross revenue shows an advance of £4,566. The sale of electricity for all purposes increased by 1,243,836 units, which is equivalent to 13¾ per cent. of the entire output, while the expenditure only increased £1,195. The balance is to be carried to the reserve fund, which now stands at £12,993. The total cost per unit, including financial charges, amounted to 2d.; the total output sold was 10¼ million units, and 5,239 consumers were supplied.

Burmah.—Sanction has been accorded to the electric lighting on Stone's system of a trial train on the Burmah Railways. This line has also some carriages fitted for electric lighting on the Vicarino-Crawford system, but none with gas—practically all trains being lit with oil lamps at present.—*Indian Engineering.*

Canada.—H.M. Trade Commissioner states that a Quebec power company intend to continue work on its new power station during the summer, and may invite tenders for the installation of a 10,000-H.P. dynamo and corresponding turbine. British manufacturers can obtain further information at the Commercial Intelligence Branch of the Board of Trade, 73, Basinghall Street, London, E.C.

The Ontario Hydro-Electric Commission is expected to develop power at Chat's Falls, 30 miles west of Ottawa, and supply power to all the towns and industries in the Ottawa Valley, as Ottawa, Arnprior, Pembroke, Renfrew, Carelton Place, Olmonte, &c. Chat's Falls is capable of developing 100,000 H.P. This water power is owned by Mr. Harty, of Kingston, who purchased it in 1887 for $100, and now asks $100,000 for it. It is thought, however, that the Hydro-Electric Commission will expropriate it at a value of about $50,000. Right at the door of Ottawa, however, are the Chaudiere Falls capable of developing up to 100,000 H.P. But this power at the north-west corner of the city, is owned and controlled by a syndicate composed of four individual interests, and is not available. The Hydro-Electric will have the disadvantage at Chat's Falls of building 30 miles of transmission lines, while the Ottawa Merger, owning the Chaudiere Falls, do not require them, and can, therefore, make a big profit by competing, on equal terms, with the Hydro-Electric Commission.

In Toronto the new rates of the Hydro-Electric Commission will, according to Hon. Adam Beck, "the Minister of Power," mean a saving to the consumers in that city of about a half million dollars annually, and in Ottawa the saving, it is estimated, will be $100,000, or in English money, £20,000 yearly, provided the Ottawa Electric Co. (independent) also reduces its rates, which it will have to in order to retain its business. Mr. Beck believes that the Toronto Electric Co. will be just as well off as now, because of the increased use of electricity consequent upon the lower price, and presumably the same would hold with the Ottawa Electric Co.

Clewer.—The Windsor R.D.C. has decided to give formal consent to certain houses at Clewer Without being supplied with current by the Windsor Electrical Installation Co., Ltd.

Caversham.—A contract has been entered into by D.C. whereby the Electric Supply Co. will light the streets for a period of ten years. Some interesting details were given at the meeting at which this decision was arrived at. Hitherto the public lighting has been by means of Nos. 3 and 4 Kern gas burners, the C.P. of the former being 65 and of the latter 85. To replace the No. 3 burners two electric lights of 55 watts will be used, which together will equal 90 C.P., while, in place of the No. 4 burners, two lights of 80 watts each will be adopted, which means that 140 C.P. will be obtained. In regard to cost, a very great saving will be effected—something like a half-penny rate. At present the Council pays 2s. 5d. per 1,000 ft. for gas. To bring the cost down to that of electricity, the price of gas would have to be reduced to 1s. 6d. per 1,000. Our correspondent adds, "it is expected that Reading will soon follow the example set by Caversham."

Continental Notes.—FRANCE.—La Société Francaise d'Eclairage, Chauffage, et Force Motrice par l'Electricité (M. Josseline-Monroc & Co.) is the name of a new company which has just been formed in Paris (10, Rue d'Hautville), with a capital of £60,000, to establish a central station for the supply of electrical energy for lighting, heating and power purposes to 28 little towns in the Cantal district of France.

NORWAY.—The first turbine at the Vemork power station, near Saaheim in Telemarken, was recently set in operation. The station is equipped with 10 turbines, of a total of 195,500 H.P., and is claimed to be the largest power station in the world. It is supplied from the regulated waterfalls of the Rjukan. The power is to be utilised for the extraction of nitrogen from the atmosphere, and is to produce 80,000 tons of nitrate per annum when in full operation. Four years have been occupied on the construction of the station, which is connected with Notodden by means of a railway.

Doncaster.—The L.G.B. has approved of a scheme of sewerage and sewage disposal prepared by Messrs. D. Balfour & Son, of London, for the Parish of Adwick-le-Street, in which is included the model village of Woodlands, in the district of the Doncaster R.D.C. The sewage from a portion of the district is to be pumped from a storage tank by means of electric motors and pumps to the disposal works, where it is to be treated in open liquefying tanks, followed by double filtration through percolating filters, the effluent from which will be discharged into Bentley dyke.

Dudley.—Applications have been made to the Corporation Electric Light Committee for a reduction in the price charged for electrical energy for power purposes after 10 p.m., and it has been decided to consent to the application by supplying electrical energy at special rates between the hours of 10 p.m. and 6 a.m. It is estimated that there will be an increase of 120 consumers of electric current during the next two years, and the sum of £1,080 must be provided for the necessary service cables. The Committee, therefore, recommends that the cables be laid and that the sanction of the Local Government Board be obtained to the borrowing of £5,500 for feeder and distributing cables and the sum of £1,080 for service cables.

The T.C. is also recommended to provide an extension of the condensing plant, to fix a mechanical stoker, and to replace an engine to enable the station to cope with the winter demand, at a cost of £1,560, to be charged to the revenue account, and extended over a number of years.

Dundee.—From the electricity accounts submitted to the T.C. on Monday, it appears that the E.L. department has had a most prosperous year. The balance of profit, after all standing charges are met, amounts to £7,254. In the course of the discussion on the accounts, Mr. J. M. Nairn said the department had done remarkably well, and although the reserve fund was only £9,000, he hoped soon to see it up to £20,000. Bailie Don called special attention to the fact that while the income had increased 15 per cent., the expenditure had only risen 4 per cent.

Eastbourne.—The electrical engineer reports that, in order to improve the light of the Seaside, from King's Arms to Archery, he proposes to replace the six double-burner and 13 single-burner gas lamps at present erected there with 60-C.P. metallic-filament lamps. These, he stated, lighted all night, will be supplied at the same rate as is at present charged for the gas, viz., £3 10s. per annum for single-burner lamps. It was resolved to fix two sample lamps of the suggested design for inspection. Of the net profit of the undertaking for the past year, £1,500 is to be transferred to the reserve fund, £632 to renewals fund, and £197 to capital account.

Eccles.—The T.C. has decided to apply to the L.G.B. for sanction to borrow £666 for the provision and laying of a H.T. electric feeder for the public lighting of several streets in the borough.

Edinburgh.—The Corporation Electric Lighting Committee recommends the T.C. to reduce the price of electrical energy for lighting to 2¾d., with discount, per unit, a reduction of ¼d. The question of the reduction in the rate for power has been delayed for further consideration.

Epsom.—The annual accounts of the electric light undertaking show a net profit of £510, as compared with £185 in the previous year, and deficits of £680 and £902 in the years 1909 and 1908. The total number of units sold was 274,669, against 250,810 last year, the increase being largely due to the opening of cinematograph theatres. The total revenue was £5,953, an increase of £595. The money at the Council's disposal to meet capital charges was now £3,249, and after paying these there was a profit of £510 as stated.

Frodingham.—A L.G.B. inquiry was held on May 30th into the application of the U.D.C. for a loan of £1,100 for electricity purposes, it being proposed to take current for street lighting from the Frodingham Iron Co. A member opposed on the ground that the Council should provide its own gasworks and "not put money into a private firm's pocket."

Farnworth.—The D.C. has decided to apply to the L.G.B. for permission to borrow £3,000 for the purposes of the electricity undertaking. The original intention was to borrow £2,190.

Gillingham (Kent).—The T.C. has decided to supply current to the Grand Theatre Co. at 3½d. per unit, subject to a guaranteed revenue of £250 per annum for two years.

Hull.—A L.G.B. inquiry was held on the 31st ult. into the proposal of the Corporation to borrow £99,332 for electricity extensions. The town clerk outlined the scheme, and Mr. Bell, the electrical engineer, explained that the present plant was becoming overloaded, and an extension was a necessity, as they were having constant applications for lighting and power. The total cost of the scheme was estimated at £101,087, which amount was, on the inspector's suggestion, applied for.

India.—A tender has been received for the electric lighting of the public offices of Lahore, and is now being considered, and a scheme will probably be matured.

This proposed lease will give the company the right to supply electric power to the general public; there is, therefore, a prospect that the long-delayed scheme of electric lighting and fans for the Civil Station of the provincial capital will be realised in the near future.—*Indian and Eastern Engineer.*

Lancaster.—Satisfaction was expressed at the meeting of the T.C. last week that the profits for the year were £488 or £400 more than anticipated. The energy supplied was:—Public lamps, 62,421 units; private consumers', contract, 31,981 units; ditto, meter, 429,418 units; tramways, 250,709 units; total (including 89,023 units used at works), 863,552 units. The revenue from the sale of current was £8,446; average per unit, 2·62d.; the cost per unit sold, 1·41d. The cost per kilowatt installed was £63·25; the total capital expenditure being £63,252.

Llangollen.—A remarkable position has arisen between the U.D.C. and the local electric light company, the outcome of a disinclination of each party to pay accounts due to the other. In view of the fact that the chairman of the electric light company and several directors are members of the Council, the clerk to which is also the solicitor of the company, it was decided to enlist the services of an outside, and perfectly independent, gentleman, in Mr. L. Lloyd John, solicitor, of Corwen, to report upon the matter.

Mr. John, who has been in communication with the B. of T., summarises his report thus:—"The position now is that the Council are the undertakers without an undertaking, and the company have an undertaking but are unauthorised." Proceeding, he points out that when in 1903 the Llangollen U.D.C. obtained a provisional order granting to them the sole right of supplying the town with electric light and power, they secured an order the powers conferred by which they are unable to divest themselves of without the B. of T.'s permission, and the latter, by an Act subsequently passed, are now unable to authorise such divestment, and the powers must remain with the authority to whom they were granted. "This sanction of the B. of T., necessary to the agreement between the Council and the electric light company, not having been obtained, as it is vital to the validity of the agreement, it follows that, as it stands, the agreement is *ab initio* bad." There is, therefore, he adds, no call to discuss accounts alleged to be owing on the basis of it.

Malton.—At the monthly meeting of the Council a letter was read from the Northern Counties Electricity Co., offering to continue the public lighting for a further period of three years from July 16th, 1911, on the same terms as the last contract—£400. It was resolved that the contract be accepted.

Portishead.—The U.D.C. has assented to the application of Messrs. Christy Bros. & Co., Ltd., for an extension of time for a year for carrying out the electric supply scheme.

Shipley.—The accounts for the past year show that the gas department has made a net profit of £738, and the electricity department a net surplus of £727.

South Africa.—The T.C. of Salisbury, Rhodesia, has practically decided to raise £120,000 for the purpose of a water supply and electric light scheme. These have long been urgently required, but have been postponed for various reasons.

It has now been decided to light Queenstown, Cape Province, by electricity.—*British and South African Export Gazette.*

South America.—The *Review of the River Plate* states that the municipality of San Fernando has cancelled the concession granted to the Compania Argentina de Electricidad for the public lighting. It will shortly call for tenders for this service, and for the erection of a power house for same.

South Shields.—The accounts for the past 12 months' working of the electricity undertaking show a profit of £1,400, as compared with a deficit of £209 for the previous year.

Spennymoor.—The U.D.C. has asked the Electricity Supply Co. to quote terms for lighting the district.

Stevenage.—The B. of T. has informed the U.D.C. that after careful consideration it has decided to revoke the E.L. order forthwith

Uruguay.—The Electric Light Council of Monte Video has finished its study of the Goverment project for the acquisition of all existing electric light stations by the nation, and for the erection of stations in important towns where these do not exist. Existing concerns will be expropriated, the price to be fixed by arbitrators. The administration of all these stations will be under the control of the Monte Video Council, which will in future be known as Council of the Electric Light Stations of the Republic.—*Review of the River Plate.*

West Bromwich.—The annual report of the Corporation electricity undertaking shows that the total income from the sale of current for all purposes was £13,684, an increase of £1,021, as compared with the previous year. There was a further decrease in the output of energy for tramway traction, amounting to £160, although the sales to private consumers for lighting and motive power showed an increase of £1,568. The total expenditure on the trading account was £7,650, against £6,902 in the previous year, an increase of £748. The gross profit for the year amounted to £6,575, compared with £6,348, an increase of £226. There is a net profit and surplus of £1,782, being an increase of £26 over the previous year.

Wrexham.—A L.G.B. inquiry was held on Friday last relative to the application of the T.C. for a loan of £4.145 for electricity purposes. There was some opposition on the part of the gas company and others.

York.—The T.C. has, in consequence of the desirability of increasing the size of the plant, asked the L.G.B. to add £1,100 to the loan of £15,000 recently applied for.

TRAMWAY and RAILWAY NOTES.

Aberdeen.—The financial year of the Corporation tramways closed last week, and the result of the year's working is considered highly satisfactory by the management. The receipts amounted to £72,406, against £70,076, an increase of £2,330. The passengers numbered 17,152,584, compared with 16,278,050 a year ago. Composition tickets to the value of £2,733 were issued during the year. The total number of miles run was 1,619,503, against 1,585,137 in 1909-10. There was paid to the Suburban Tramways Co. in allowances a sum of £1,772, compared with £1,757 during the preceding 12 months. The total revenue from all sources for the year was £73,465, or £2,343 more than for the preceding year. Expenditure in many cases is down, but there have been heavy outlays on the track, particularly in regard to the fitting of renewable plates at the joints of the rails. This work alone cost from £600 to £700, and the money is to be taken from revenue instead of from the renewal account. It is believed the profit for the year will show an increase of £2,000, a figure which has never been reached since the Corporation acquired the tramways.

The Committee has authorised the surveyor, as an experiment, to have 50 of the joints between Bridge Street and Holburn Street welded by the Tudor Accumulator Co., the cost being estimated at £2 14s. per joint.

Accrington.—The umpire-arbitrator in the proceedings between the Accrington Corporation and the Haslingden Union, respecting the assessment of the portion of the Accrington tramways within the union area, has published his award. The Haslingden Union originally fixed the rateable value at £1,650, this being a provisional assessment, and the figure was afterwards reduced to £825, which was to stand for two years. The Accrington Corporation, who claimed an assessment of £650, gave notice of appeal to Quarter Sessions. Eventually the matter was referred by consent to arbitration, the following being appointed:—Corporation valuer, Mr. Michael Faraday, of London; Union valuer, Mr. W. Haslam Cross, of Manchester; umpire, Mr. Wainwright, of Liverpool. The arbitrator's award fixes the rateable value at £2,549. It was reported at the meeting of the Haslingden Guardians on Wednesday, May 31st, that Accrington will take steps to set aside the decision, on the ground that there is an error in the award and that the basis of the finding is not given.

Belfast.—On Friday last, in accordance with the agreement arrived at between the City Council and the Cavehill and Whitewell Tramway Co., pending the settlement of the legal points arising out of the award of the arbitrator, the working of the Glengormley tramways came under municipal control. The new service—run, of course, with Corporation cars—worked with the greatest smoothness, and there was no hitch in the arrangements. The delightful weather conditions had the effect of inducing a very large number of people to patronise the service, and during the afternoon and evening the traffic was so heavy that extra cars had to be brought into service.

Blackpool.—The estimates of the tramway department for the ensuing year show that it is expected that the tramways will yield a profit of £7,500 after making all allowances for capital charges and other expenses. Top-deck covered cars have been found most advantageous, and the number of these cars is to be increased by four other old Marton cars being fitted with these top-deck covers at a cost of £95 each.

Brighton.—The Corporation tramways for the last financial year show a total revenue of £50,747, a decrease of £611 as compared with 1909-10. The working expenses included £10,386 for repairs and renewals, and amounted to about £600 above the previous year. The net profit was £137.

Canada.—A charter has been granted to the Alberta Electric Railway Co., which was formed last October with a capital of $10,000,000. The company expects to commence work on the new road, which will run between the town of Medicine Hat and Banff, with Calgary as the main seat of operations, at once. The first portion of the line to be finished will be from Calgary to Banff, which is expected to be open for traffic within 18 months. This section of the line will be some 80 miles in length, and will be operated by as many trains as traffic calls for.

Continental Notes.—FRANCE.—The municipal authorities of Nantes have just given their approval to a scheme for the conversion of the compressed-air tramway system in the town to electric traction.

GERMANY.—The work of constructing the Hamburg high-level railway by the Siemens & Halske and the A.E.G. Co. has progressed so far that it will be possible to open the line for traffic within a short period. The electrical companies to which the working of the line has also been entrusted have now formed, in accordance with the terms of the concession, a special operating company, under the title of the Hamburg Elevated Railway Co., and with a share capital of £750,000.

Dartford.—The U.D.C. has sealed a lease for a term of 10 years of the light railways to Messrs. J. G. White & Co., Ltd. The lease is determinable at the option of the Council at the end of five years.

Eccles.—The Town Clerk has received notification that the Salford Corporation has petitioned in the House of Lords against the decision of the Court of Appeal in the action instituted by Eccles Corporation against the South Lancashire Tramway Co. and the Salford Corporation, in regard to running powers over the tramway in Eccles from Winton to Worsley.

Glasgow.—The year's balance-sheet of the T.C. Tramways Department, which has just been issued, easily constitutes a record from the point of view of revenue, the actual traffic receipts amounting to the huge sum of £946,021. Receipts from other sources are not yet made up, but when they are completed it is computed that the revenue of the department will only be a few thousand pounds short of the million. The figures of the traffic receipts for the previous five years are: 1905-6, £813,763; 1906-7, £887,380; 1907-8, £907,494; 1908-9, £889,530; 1909-10, £893,591. The increase for this year over last is over £52,000, or, roughly, £1,000 per week. The number of passengers carried totalled 237,967,307, an increase of 15,236,736. Of this total the 1d. fares amounted to 130,519,231, or rather more than under two millions of the previous year's total, but this is accounted for by the fact that, for the past four months, two-stage fares have been in existence, and these were responsible for nearly 11 millions of the total. Halfpenny fares accounted for well over 66 millions, and 1½d. fares for close on 19¼ millions, the remaining totals for the other distances being very considerably less. The average track mileage open during the year (single) was 194¼ miles—increase, 5¾ miles; car-mileage, 21,704,237 miles—increase, 730,221 miles; traffic receipts per car-mile, 10·461d.—increase, ·236d.; traffic receipts per passenger, ·954d.—decrease, ·009d.

The unskilled workmen in the employment of the Tramways Department have been pressing for an increase of wages, and at their last meeting the T.C. adopted the proposal of a special committee by which an increase of 1s. per week was granted to a number of the men. This will affect 1,004 out of the 1,472 unskilled employés and involve an extra annual cost of £4,458 to the department. In the meantime no increase will be given to the remaining 468, who are mostly aged.

Hatfield (near Doncaster).—Preparations are being made for an early commencement of the construction of the light railway from Hatfield Moor to Cautley.

London.—As a result of the very severe storm which occurred on Wednesday evening last week, both the Metropolitan and District electric railway services were suspended for a considerable time owing to flooding; the London United tramways in the neighbourhood of Kingston were also held up from the same cause.

L.C.C.—The Highways Committee, in reporting on the question of extending the issue of workmen's tickets to all cars leaving suburban termini up to 8 a.m., says:—"We have had before us the results obtained from the running of workmen's cars during the year ended March 31st, 1911. During this period the receipts from the workmen's electric car services amounted to £158,040. The total charges in respect of the same services amounted to £219,342, namely, working expenses £136,394, provision for renewals at ¾d. a car-mile £13,946, debt charges allocated according to car-mileage £69,002, showing a deficiency of £61,302. In respect of the horse-car services the receipts from workmen's fares during the same

period amounted to £3,203, the working expenses to £6,370, and the debt charges to £1,463, or a deficiency of £4,630. This shows a total deficiency on the whole of the workmen's car services of £65,932.

"These results represent the actual receipts from the workmen's car services and the average working expenses per car-mile over the whole of the tramway routes. In reality, however, the cost of running the workmen's cars, a few of which run during the early hours of the morning after 1.30 a.m., is for various reasons appreciably higher than this average. The cost of power is greater owing to the plant at the generating station having to be kept running for a load too light to be economical, while the sub-stations have to be run under similarly disadvantageous conditions. A further reason for this higher working cost is the fact that the number of employés required for the operation of the workmen's cars is greater in proportion than in the case of the ordinary cars.

"During the year mentioned 11 per cent. of the total electric car-mileage was run at workmen's rates. The receipts from the workmen's cars averaged only 7·554d. a car-mile. The traffic receipts from the cars run at ordinary rates during the same year averaged 11·414d. a car-mile; this average was, however, reduced to 10·990d. a car-mile by the addition of the workmen's car-mileage to the total. The difference between the two last-named figures if applied to the total electric mileage for the year would have amounted to £80,814. These results do not take account of the 25,400,000 passengers who were carried with return tickets on ordinary cars at workmen's rates, as it is impossible to give with exactitude the decrease in receipts per car-mile on ordinary cars due to passengers travelling with workmen's return tickets. We are advised, however, that this decrease is certainly not less than £50,000 a year.

"If the time of running workmen's cars were extended to 8 a.m. this would mean that workmen's fares would be charged on cars reaching London termini as late as 9 a.m., and a most serious inroad would be made upon the revenue derived from the services which under the present conditions are the most remunerative and upon which the Council is in a large degree dependent for its surplus.

"It has been pointed out to us that, as routes are extended and as the population increases in the more remote districts of the county, the proportion of workmen's car-mileage to the total must inevitably increase. In proof of this we would refer to one particular route on which careful observations have been taken—namely, the Clapham and Tooting route. In each week during the month of January, 1906, the workmen's car-mileage on this tramway was 6,936 miles. For each week of the month of January, 1911, the workmen's car-mileage on the same route was 11,190 miles, representing an increase of 61·33 per cent."

The Committee adds that, apart from concessions to the travelling public, it has, under the recently-adopted scheme of conciliation boards, already agreed to increased expenditure amounting to £12,000 per annum as regards a section of its employés.

Keighley.—The statement of the tramways department shows a profit of £3,960 for the year, an increase of £435. The surplus for the year was £1,205, an increase of £458. It is proposed to carry a sum of £766 to the credit of the omnibus account. The passengers carried numbered 2,204,554, an increase of 78,754; car-miles run, 241,914. On the motor-omnibus service there was a profit of £386, compared with £534.

Morley.—The Corporation has given notice of its intention to construct light railways within the area of the borough, as follows:—(*a*) From a point near Fountain Inn, Queen Street, along South Queen Street, Bridge Street, to Tingley Mills; and (*b*) from a point near Fountain Inn, along Fountain Street, Bruntcliffe Road, to the Old Angel Inn.

Nelson.—There was a L.G.B. inquiry on June 2nd into the Council's application to borrow £14,525 for the purpose of street improvements. The town clerk said the money was mainly required for the purchase of property for widening the thoroughfare at Nelson centre, and the expenditure included the alteration to light railway track and overhead equipment estimated to cost £1,325.

St. Helens.—It was announced on Tuesday that the local Tramways Committee had again considered the proposed rearrangements of the tramway routes in the centre of the town, and had intimated to the Corporation that the alterations were impracticable.

South Shields.—The annual report of the general manager (Mr. L. E. Harvey), just issued, states that a higher profit had been recorded than in the previous year, namely, £2,343, an increase of £693. This improvement was almost entirely due to economies of energy. It is pointed out that this year's receipts did not include those for Easter Monday, while in the previous year's receipts two Easters were included. The units consumed by the cars were 899,056, as compared with 1,070,343, a saving of 171,319, equal to 16 per cent. The traffic revenue was £29,046, and the average takings 8·62d. per car-mile. The working expenses were £18,493, and the reserve fund was £9,469. The capital outlay to date has been £172,255.

The Tramways Committee has decided to give a bonus of 5s. to every man, and 2s. 6d. to every boy employed on the system on Coronation day.

Stalybridge.—On Whit-Monday a serious runaway accident occurred on the Joint Board's tramway system, when a double-deck car on the steep and dangerous incline known as Ditchcroft Hill got beyond control, and finally leaving the track at a sharp curve, overturned. Between 30 and 40 people were injured, 13 seriously. Two previous accidents have occurred at this part of the system. Six years ago a car left the track at about the same place, and partly wrecked two cottages, while, three years ago, a somewhat similar accident happened, a car running through a wall before it came to a standstill. According to the *Times*, the trolley slipped off the overhead wire and the car ran backwards. The Joint Board is understood to be insured.

West Bromwich.—The annual accounts of the Corporation's tramway undertaking were issued last week. They show that no additional borrowing powers have been applied for, or capital expenditure incurred during the year. The total loans raised for the purpose of the undertaking amount to £152,397, the expenditure on capital account being £147,758, and the balance. £4,638, has been transferred to sinking-fund account. The net debt outstanding is now £115,358. Rent has been received from the tramways company amounting to £8,608, less income-tax of £502, and there is a net deficiency on the undertaking of £131

TELEGRAPH and TELEPHONE NOTES.

All-British Cables.—At a banquet in Bristol on Tuesday, Sir Joseph Ward, Premier of New Zealand, advocated the laying of a State cable to link up the Empire.

Belgium.—The Brussels correspondent of the *Times* states that the Belgian postal authorities have just inaugurated for internal communication a system of telegraphic subscriptions, by means of which newspapers, business houses and any persons who, while making daily use of the telegraph, do not wish to rent a private wire, are enabled to transmit their messages at about one-half of the ordinary rates. The only conditions attaching to the system, which Belgium is the first country to adopt, are that a minimum number of 250 words per day shall be paid for, and that the messages shall be transmitted between stated hours. The Belgian Government is now desirous of obtaining the consent of Great Britain, France and Germany, in order that a similar system may be established between Belgium and those countries.

Constantinople Telephone System.—Messrs. F. Gill and W. W. Cook, engineer-in-chief and assistant engineer-in-chief of the National Telephone Co., have been appointed consulting engineers to the Constantinople telephone scheme, the formal agreement for which was executed between Djavid Bey, then Minister of Finance, and Mr. Herbert Laws Webb, at Constantinople on May 6th last. A staff of engineers left London this week to make a telephonic survey of Constantinople and to prepare plans and specifications for the system, which is to have an original capacity of 10,000 lines, and to be ready to start service in July, 1913. Mr. John Scott is in charge of the engineering force, and left London last week for Constantinople. The work Mr. Scott has in hand is one of many difficulties, as Constantinople is the most peculiarly situated of all European capitals. The city is divided by the Bosphorus, which is deep and has swift and variable currents; moreover, it is extensively used as an anchorage. The European section is again divided by the Golden Horn, an arm of the sea over which there is no permanent bridge. In all parts of the city the streets are extremely primitive, narrow, winding and ill-paved, and many of them are precipitous hills.

As no telephone service yet exists in Turkey, all modern facilities having been debarred by the ex-Sultan, there are no available data whereby to gauge the probable use of the service or the probable traffic which the system will be called upon to carry. The peculiar composition of the population of Constantinople, about one-half of which consists of non-Moslem races, Greek, Armenian, Jewish, and so on, makes the business part of the engineering study one of much complexity. Three languages are current—Turkish, Greek and French—while many more are spoken, and the variety of local customs and practices is probably greater than in any other large city in the world. No exact statistics exist, but the population of the area is estimated at between 1,000,000 and 1,250,000 inhabitants. Means of communication are at present so primitive and expensive that a large demand for the telephone service may be anticipated.

The Telephone Development Co., Ltd., has been formed for the purpose of carrying on the necessary work, pending the organisation of the Ottoman Telephone Co., which will construct the plant and operate the service.

Greenwich Time Signals.—The P.M.G. announces a reduction in the charges for transmission of the 10 a.m. time signal from Greenwich over private wires to premises in the London telephone area. Telephone exchange lines cannot be used for this purpose. To places within half a mile of a London town sub-post office the inclusive charge is £6 per annum; for greater distances an additional charge of £4 or £5 per mile beyond ½ mile is made. The apparatus for receiving the signal must be provided by the renter; approved apparatus is made by the Magneta Co., Ltd., the Synchronome Co., the Standard Time Co., and Messrs. Gent and Co., Ltd.

New Zealand.—The *Australian Mining Standard* states that the New Zealand Government has decided to erect a high-power wireless telegraph station on the Tinakori Hills behind Wellington. The work will be commenced at an early date.

International Telegraph Tariff.—An International Telegraph Commission, which has been sitting in Paris, has passed a resolution favouring the reduction of charges on long-distance telegrams in plain language (*i.e.*, not in code) by 50 per cent. The United Kingdom has been represented by Sir Matthew Nathan, Secretary of the Post Office.

New Cable.—The Great Northern Telegraph Co. are laying a new cable between Nystad (Finland) and Grisslehamn (Sweden), triplicating the company's direct connection between Gothenburg and St. Petersburg. The work is being carried out by the company's own cable steamer *H. C. Orsted*.

Telephones in the U.S.A.—A report by four of the chief officials of the Post Office on recent investigations into the development of the telephone service in the United States, has been issued. One of the party—Mr. T. F. Purves—states, says the *Daily Mail*, that the telephone service in the large towns of America is distinctly smarter than in this country; since his return "the local London service has seemed more irritatingly slow than it did before." The average delay before a trunk connection can be obtained in England is not much greater than in America, except between large cities, where the superiority of the American trunk service is indisputable, the trunk lines being far more numerous; at the same time, the cost of a trunk call is correspondingly greater there. At present there are not fewer than 250,000 telephones working through automatic exchanges in the United States, and in Chicago eight automatic exchanges of 10,000 lines each are being installed. An automatic exchange is to be experimentally installed at the General Post Office.

Wireless Telegraphy.—According to the *Indian and Eastern Engineer*, wireless telegraphy is to make great strides in Asia. The Military Department of the Government of India is arranging a series of stations which will in the first instance cover Calcutta, Delhi, Allahabad and Jutogh (Simla), the work being carried out by the Marconi Co. The French Government also is contemplating stations connecting up Pondicherry, Saigon, and its African Colonies. Again, the British Admiralty have in hand a scheme for linking Aden, Karachi, Bombay, Colombo, Singapore and Hong-Kong, which system would, of course, be in communication with the contemplated Indian land stations.

CONTRACTS OPEN and CLOSED.

OPEN.

Australia.—June 14th. Cable, ironwork, cast-iron pipes, iron or steel poles, phosphor-bronze wire, &c., for the P.M.G.'s Department in Queensland. See "Official Notices" May 5th.

July 19th.—Insulators, telephones, copper wire and iron wire, for the P.M.G.'s Department in Queensland. See "Official Notices" June 2nd.

BRISBANE.—July 19th. 199 tons of copper wire, and 180,000 porcelain insulators for the P.M.G.'s Department, High Commissioner's office, 72 Victoria Street, S.W. and Board of Trade C.I. Department, E.C.

June 27th.—1,400 protectors for use on main distributing frames at magneto exchanges, for the P.M.G.'s Department in Victoria. See "Official Notices" May 5th.

July 25th.—Deputy-P.M.G., Melbourne. Twelve sections of a branching multiple magneto lamp-signalling switchboard, &c., or one automatic or semi-automatic switchboard, for the P.M.G.'s Department in Victoria. See "Official Notices" March 24th.

MELBOURNE.—August 1st and 8th. 150 miles of insulated wire, and 5 miles of telegraph cable, for the P.M.G.'s Department.

Batley.—The Electric Lighting and Tramways Committee is to invite tenders for cable extensions.

Beckenham.—June 12th. Electric wiring of houses, for the U.D.C. See "Official Notices" May 19th.

Blackpool.—Arc lamp carbons for two years, for the Corporation Electricity Department. See "Official Notices" May 26th.

Canada.—July 3rd. Apparatus and material for a police patrol telegraph system. Specification, &c., from Mr. F. A. Cambridge, city electrician. A copy can now be seen at the Board of Trade Commercial Intelligence Dept., London. Tenders to Chairman, Board of Control, Winnipeg.

MONTREAL.—June 29th. Fourteen motor-driven centrifugal pumps, electrically-driven rotary blower, &c., for the Public Works Office. (Board of Commissioners, City Hall, Montreal.)

Douglas (Isle of Man).—June 13th. 1,000 tons of steam coal for the Tramways Committee of the T.C. A. Robertson, town clerk.

Egypt.—June 15th. Complete electric pumping plant, for Minister of Public Works, Cairo. Mr. A. L. Webb, C.M.G., Queen Anne's Chambers, Westminster, Specifications (two guineas deposit) from Controller-General, Main Drainage Department, Public Works Ministry, Cairo.

Heston and Isleworth.—June 14th. Metallic-filament lamps for street lighting (400 posts), for one year, for the U.D.C. See "Official Notices" May 19th.

London.—July 4th. Four electric traversers for carsheds. See "Official Notices" May 26th.

June 12th.—Hemp and steel wire lift ropes for 3 years for H.M. Office of Works. See "Official Notices" June 2nd.

POPLAR.—June 19th. One 3,000-KW. turbine alternator, with surface condensing plant, two water-tube boilers with superheaters, air heaters, fans and chimneys, one 30-ton electric overhead travelling crane and water-softening plant, for the B.C. See "Official Notices" May 26th.

June 30th.—Surface condensing plant at the South Kensington generating station, for H.M. Office of Works. See "Official Notices" June 2nd.

Manchester.—June 27th. Two water-tube boilers with superheaters, coal chutes, ash conveyor and fuel economisers, for the Corporation Electricity Department. See "Official Notices" to-day.

Mexborough.—June 10th. Balancer-booster set for the U.D.C. Electricity Department. See "Official Notices" May 26th.

Oldham.—One 1,200-KW. mixed-pressure steam turbine coupled to two D.C. generators in tandem, with barometric condenser, pumps, &c., for the Corporation. See "Official Notices" May 26th.

Spain.—June 21st. The Harbour Works authorities at Cadiz are inviting tenders for the supply of four electrically-operated cranes.

June 30th.—The municipal authorities of Toro are inviting tenders for the concession for the electric lighting of the town during a period of 25 years.

Stockport.—June 14th. Materials for the Corporation Electricity and Tramways Departments. See "Official Notices" May 26th.

Swansea.—June 13th. Continuous-current motors and starting switches for one and two years, for the Corporation. See "Official Notices" June 2nd.

Swindon.—June 20th. Battery, traction booster, three-wire hand regulated booster, and switchgear for the Corporation electricity works. See "Official Notices" June 2nd.

Turkey.—June 26th. Electric accumulators for the Ministry of War for the fez factory at Eyoub and for the tailoring workshop at Ahir Capou. Local representation. See *Board of Trade Journal*.

Worthing.—June 12th. Two Diesel oil engines and continuous-current generators, for the Corporation. See "Official Notices" May 19th.

CLOSED.

Australia.—The *Australian Mining Standard* reports among other tenders accepted by the Government the following for the P.M.G.'s department at Victoria:—

Western Electric Co.—200 telephone sets, £250; 3 tons, twisted pair, outside distributing wire, £157 10s. per ton, £472 10s.
International Electric Co., London.—Schedule 804, £184.
Noyes Bros.—86½ tons wire, galvanised iron, £407.
J. Bartram & Son.—Various items, £7,152.
India-rubber, Gutta-percha & Telegraph Works Co.—275 boxes, £494, and 350 boxes, £595.

Austria.—The municipal authorities of Humpoletz, Bohemia, have lately placed a contract with the Electricitäts Gesellschaft (Kolben & Co.), of Prague, for the establishment of a small central electric lighting station in the town.

Blackburn.—The T.C. has accepted the tender of the British Westinghouse Electric and Mfg. Co., Ltd., for a 2,000-KW. turbo-generator and two rotary convertors.

Croydon.—The T.C. has accepted the tender of Messrs. Johnson & Phillips, Ltd., for 51 magazine arc lamps.

Derby.—The T.C. has accepted the tender of Messrs. Spencer, Ltd., for 35 trolley standards for the tramways, at £187.

G.P.O.—Messrs. Siemens Bros. Dynamo Works, Ltd., have obtained the contract for the supply of tantalum and "Onewatt" metal-filament lamps of various voltages and candle-powers, for the G.P.O. for the ensuing six months.

Leek (Staffs.).—The U.D.C. Lighting Committee has accepted the tender of Mr. Thomas Grace, at £262, for engine foundations and concrete water-tank, in connection with the new Diesel oil engine.

Leyton.—The U.D.C. has accepted the tender of Messrs. Mordey, Fricker & Co. for the annual supply of electrolytic slot meters, 1½, 3, 5, and 10 amperes; that of Messrs. Measures Bros

Ltd., for wrought-steel work for additional flue dampers, £27; and that of the Tudor Accumulator Co. for a battery to test tramway meters, £29. Tenders have been received for the annual supply of ordinary electric meters. The engineer has been authorised to order these as required during the year. The Albert Boston Co. has secured the contract for illuminations and decorations for the Town Hall, Leyton, and the Library, Lea Bridge Road.

London.—MARYLEBONE.—The B.C. has accepted the tender of Messrs. Geipel & Co. for the annual supply of arc lamp carbons.

Telephone Cable.—It is reported from Berlin that Messrs. Siemens Bros. & Co., Ltd., of London, have received an order from the State Telegraph authorities of England and Belgium for the supply of about 50 miles of gutta-percha cable having Pupin coils, for the purposes of telephone communication between England and Belgium. It will be remembered that the company laid about 25 miles of similar cable between England and France in 1910.

Worksop.—The U.D.C. has accepted the tender of the Wigan Coal and Iron Co. for nutty slack for the electricity works, at 4s. 9d. per ton at Manton Pit, and cobbles at 9s. per ton; and that of Messrs. W. F. Stanley & Co., Ltd., for one theodolite, at £30

York.—The Electricity Committee of the T.C. has accepted the tender of the Tudor Accumulator Co., Ltd., for replating the battery at the works, and the supply of an automatic reversible booster, switchboard, cables, &c., at £1,625.

FORTHCOMING EVENTS.

Physical Society.—Friday, June 9th. At 9 p.m. At the Imperial College of Science. Paper on "The Measurement of Contact Differences of Potential," by Prof. Anderson and J. G. Bowen; and "Exhibition of a Model Illustrating the Passage of a Light Wave through Quartz," by Mr. H. S. Allen; and other papers.

North of England Institute of Mining and Mechanical Engineers.—Saturday, June 10th. At 2 p.m. At the Memorial Hall, Newcastle. Paper on "The Electrification of the Underground Machinery at Trimdon Grange Colliery," by Mr. S. Tate, to be discussed; and other papers.

THE ELECTRICAL ENGINEERS
(LONDON DIVISION).

THE following orders are issued:—

Commanding Officer—COL. H. M. LEAF.

Monday, June 12th.—"A" Company. Technical drill, 7 to 9 p.m.
Tuesday, June 13th.—"B" Company. Technical drill, 7 to 9 p.m.
Wednesday, June 14th.—Gymnastic classes, 7 to 10 p.m.
Thursday, June 15th.—"C" Company. Technical drill, 7 to 10 p.m.; recruits' drill, 7 to 8 p.m.
Friday, June 16th.—"D" Company. Technical drill, 7 to 10 p.m.; recruits' drill, 7 to 8 p.m.
Saturday, June 17th.—No parades.

(Signed) J. H. S. PHILLIPS, Major L.E.E.

NOTES.

Coronation Holidays.—Owing to the Coronation Holidays of Thursday and Friday, June 22nd and 23rd, it will be necessary for us to publish the issue of the ELECTRICAL REVIEW, which is due on the latter date, a couple of days earlier, namely, Wednesday morning, June 21st. This involves alterations of our working arrangements, just as in the case of Good Friday week, and matter must reach us on the following days:—

Editorial.—Letters for Correspondence must be received by Monday morning, June 19th (first post), and notes and general news in the course of the same day. Special late news will be welcomed up to Tuesday morning, June 20th.

Advertisements.—New copy and alterations to existing displayed advertisements, to be received by Friday morning, June 16th. Official Notices and small prepaid advertisements by 9.30 a.m. Tuesday, June 20th.

City and Guilds of London Institute.—The report of the Council for the year 1910 sets forth the terms of the supplemental charter granted to the Institute in December last, under which the City and Guilds Central Technical College is made to include the whole of the Engineering Department of the Imperial College, under the control of a "Delegacy" consisting of 19 members—eight members of the governing body of the Imperial College, eight members of the Institute, and three members appointed by the Goldsmiths' Company. A building is being erected by the Imperial College on land at South Kensington which will ultimately be added to the Central Technical College, forming with it the Engineering Section of the Imperial College; the whole, towards which the Goldsmiths' Company have made a grant of £50,000, will be known as "The City and Guilds College" (Engineering).

Prof. Henrici, on the ground of advancing age, and Prof. Armstrong, in view of the redistribution of the chemical work of the Imperial College, are retiring at the end of the present session, and have been appointed Emeritus Professors by the Executive Committee. New engineering workshops have been completed, under the direction of Prof. Dalby; the whole of the machinery is now driven electrically, the larger tools having separate motors.

The table of students attending courses of instruction at the Central Technical College shows that the falling-off in the number following the Electrical Engineering Course, which commenced in 1905, still continues, the number last year being 102, as compared with 160 in 1904-5; the number of students in the Civil and Mechanical Engineering Department, on the other hand, goes on increasing, being now 237, or double the number in 1901-2. The total number in the two departments has been practically constant at about 340 for the last five sessions. It should be understood, however, that all students except those attending special courses receive instruction in all departments of the College, and the reduction in the number of students attending the Electrical and Chemical Departments is mainly due to the transfer of first-year students to the Royal College of Science.

The Siemens Memorial Medal and Premium were awarded to J. D. Peattie. Last year 34 students of the College obtained the degree of B.Sc. (Engineering) in the University of London, all but 4 with Honours. More than half the internal degrees conferred by the University in Engineering since the examination was inaugurated have been taken from the C.T.C., 157 in all, as compared with 149 from all other Colleges.

A continued diminution in the entry of students at the Technical College, Finsbury, is ascribed mainly to the depression in the electrical industries, the electrical department being the one that has suffered most.

From 180 in 1905-6, the total number attending the mechanical and electrical engineering day courses has fallen steadily to 116 in 1909-10; in the former year the mechanical students numbered 83 and the electricals 97; the numbers now stand at 59 and 57. From 1901 to 1904 the electrical students numbered 107 to 110. The evening students last year were 233 in number, as compared with 291 in the preceding session.

Examinations in Technological subjects were held at 418 centres in the United Kingdom last year, as well as at many Colonial centres, and the total number of candidates was 26,878.

At the Central Technical College, students' fees amounted to £14,746, and the net current expenditure to £21,544, the difference of £6,798 being defrayed by the Institute. The total expenditure under all heads was £26,754. At Finsbury, students' fees amounted to £3,025, and the net current expenditure to £11,903, the net cost being £8,878. The total expenditure was £12,448.

Amongst the various additions to the equipment of the Electrical Engineering Department of the C.T.C. (Prof. T. Mather, F.R.S.) it is interesting to note that a receiving aerial for wireless telegraphy has been suspended from the central tower of the Imperial Institute, forming one of the highest aerials in Europe, with which messages from foreign countries are easily picked up.

Invisible Light.—Prof. R. W. Wood, of the Johns Hopkins University, Baltimore, recently delivered an address at the Royal Institution on experiments which he has carried out with "invisible light," *i.e.*, portions of the spectrum which are incapable of exciting the retina. Using a quartz lens coated with silver, which is opaque to ordinary light, but transparent to ultra-violet rays, he was able to make a remarkable series of photographs of various objects, comparing them with photographs of the same objects made in the ordinary way. Objects which do not reflect ultra-violet rays come out black; a man standing in bright sunlight is found to cast no shadow when photographed by ultra-violet light, proving that the latter reaches the surface of the earth mainly by diffusion from the sky, not directly from the sun. The air surrounding an electric spark appears luminous by ultra-violet light, showing that some hitherto unknown radiation is given off. Photographs have also been made with the infra-red rays.

The Anchor Cable Athletic Club.—A highly successful gala was held on Monday last, on the Anchor Co.'s ground, to mark the opening of the new bowling green which has recently been laid for the employés at a cost of nearly £200. The bowling green was formally opened at 10.30 a.m. by Mr. J. Bowyer (works manager), in the unavoidable absence of Mr. James Callender. An opening game was played between Mr. Bowyer and Mr. L. Wood. A handicap for members, with an entry of 75, was then begun, for prizes given by Mr. T. O. Callender, Mr. J. O. Callender, Mr. J. Bowyer, and the club, the following coming out winners in the order named:—Messrs. F. Crank, J. Lyon, senr., J. Garvey, and W. Birkenhead. In the afternoon the ground, which was gaily decorated with bunting and flags, presented an animated appearance. The weather was delightful, and the employés of the company, with their wives, families, and friends, attended in large numbers. A cricket match took place between a team of ladies, captained by Miss A. Crompton, and a team of gentlemen, captained by Mr. A. Crook, and after an amusing and interesting game, resulted in the gentlemen being defeated by seven runs. The latter, however, were penalised, inasmuch as they had to bat with broom sticks, and to bowl underhand at one stump when the ladies were batting. In another part of the ground sports were held in the afternoon and evening, the events including flat and sack races, toy wheel-barrow, and obstacle races, &c. Tea was served to over

300 persons in a large marquee, where in the evening a concert was given by members of the club and their friends. The Leigh Borough Brass Band was in attendance and rendered selections at intervals, and in the evening played for dancing. During a break in the evening concert, Mr. Bowyer said he hoped that that would be the first of many similar gatherings. Mrs. Bowyer afterwards presented the various prizes to the successful competitors. Mr. E. J. Gibbs acted as hon. secretary. The club now possesses a bowling green with fully-licensed club house, a cricket field with laid crease, a laid tennis court, and a football ground. The directors of the company have acted generously and have been encouraged to do so by the enthusiasm shown by the members of the club, all of whom are necessarily employés of the company.

Greenwich Time.—We recently had an opportunity of inspecting the first "central exchange" of Greenwich Time, Ltd., at 106, Albany Street, N.W. This company has been formed to provide London with similar facilities in the way of synchronised time, to those afforded by the Normal Zeit Co., in Berlin, which controls some 30,000 clocks in and near the city. Greenwich time signals, received through the Post Office once an hour, regulate a special "precision" clock, which, in turn, electrically controls an Exchange clock to which the customers' or service clocks are connected by means of Post Office wires. The customers' clocks are of the self-contained electrically-wound pattern, and each one switches through to the exchange clock at intervals of four hours, recording on a paper tape its time interval for comparison with the time intervals (also recorded) of the exchange or master clock, and at the same time being advanced or retarded by the electrical control of the latter as may be necessary to ensure accuracy. As the service clocks are independent time-pieces, a temporary breakdown of the synchronising arrangements, either at the exchange or between the latter and Greenwich, will not disorganise the service. The company's aim is to provide a "time service," and to this end it will supply clocks on a hire-purchase system, and guarantee maintenance and regulation to Greenwich time.

The Government of Portugal has decided to adopt Greenwich time as the legal time in Portugal from January 1st, 1912. This is the last of the Western European countries to adopt this standard, which is now recognised throughout almost the whole of Europe.

Electricity on the White Star ss. "Titanic."—The new 45,000-ton liner, *Titanic*, which was launched last week at Belfast, has a very complete installation for electric power and lighting. A plant consisting of four 400-KW. sets is installed in a separate watertight compartment aft of the main engine room at tank top level. The engines, which each indicate about 580 H.P., are of the Allen three-crank type, running at 325 R.P.M. These exhaust either into a surface heater—which is the usual seagoing condition—or to the condenser. Each engine is direct-coupled to a compound-wound continuous-current 100-volt dynamo, so that their collective capacity is 16,000 amperes. The dynamos are fitted with interpoles. In addition to the four main generating sets, there are two 30-KW. engines and dynamos, placed in a recess off the turbine room at saloon deck level. These sets can be supplied with steam from either of several boiler rooms, and will be available for emergency purposes; they are similar to the main sets, but the engines are of the two-crank type. The distribution of current is controlled and metered at a main switchboard placed on a gallery in the electric engine room, to which the main dynamo cables and feeders are connected. The latter pass up through port and starboard cable trunks to the various decks, radiating from thence to master switch and fuseboxes grouped at convenient points in the machinery spaces and accommodation, from whence run branches to the distribution fuseboxes scattered throughout the vessel, controlling the lamps and motors. A complete system of electric lighting is, of course, provided, and electricity is also largely employed for heating, as well as for motive power, including no fewer than 75 motor-driven Sirocco fans of from 55 in. to 20 in. in diameter, for ventilating all the passenger and crew spaces, as well as the engine and boiler rooms. All fan motors are provided with automatic and hand speed regulation.

A Novel Generator of Electric Waves.—The electric waves generated for the purposes of wireless telegraphy and telephony by electric sparks or arcs are of limited energy and imperfect constancy. Endeavours have therefore been made to generate such waves in electrical machines, the output of which—like that of ordinary dynamos—could be increased at will by increasing their dimensions. However, in the designing of high-frequency alternators, it is found very difficult to ensure at the same time a high output.

Dr. Rudolf Goldschmidt, of Darmstadt, has invented a novel process for simultaneously ensuring high frequencies and high outputs (*Elektrot. Zeitschrift*, No. 3, 1911). His machine is designed on the lines of a three-phase induction motor, the slip-rings of the rotor being electrically connected with the terminals of the stator. The stator is fed with direct-current from a battery (protected by a choking coil against alternating currents), and the rotor is made to rotate at a certain speed. The rotor and stator are separated by condensers, permeable only to alternating currents, so that the direct-current only flows through the stator. The currents (of a frequency corresponding to the speed of rotation) which are then produced in the rotor will pass through the condensers into the stator coils, there producing a three-phase field which in turn rotates at the same speed as the rotor, but in an opposite direction, thus producing in the rotor currents of twice the frequency corresponding to the speed of rotation; these in their turn pass into the stator, setting up currents of a triple frequency and so forth. This automatic transformation, theoretically speaking, thus results in the production of infinitely high frequencies.

The currents of lower frequencies which are not utilised are made to flow through short-circuited conductors, and only the frequency which is actually to be used is supplied to the antenna. There is then inside the machine a conversion from low to higher frequencies at a very considerable efficiency, which increases up to a given limit as the frequency increases, any increase in frequency being attended by a conversion of further mechanical into electrical energy.

The stator and rotor are comparable to a stationary and a rotating mirror respectively, between which the electrical energy is thrown to and fro in a similar manner to light rays. Reflection is attended by an increase in frequency (owing to the relative motion of the mirrors), being the more perfect as the mirrors themselves absorb less energy, *i.e.*, as the vibratory circuits are more free from damping. The inventor, therefore, suggests the name of "reflection generator" for his machine.

The first machine of this type has for some time been in operation at Messrs. C. Lorenz A.-G.'s radio-telegraphic station, at Eberswalde, near Berlin. This machine supplies 12·5 KW. with a wave length of 10,000 metres, while 8-10 KW. are still obtainable with waves of 5,000 metres. No difficulty is experienced in designing machines of 60, 80 KW. and more, and in generating waves of 3,000 metres. The efficiency with a wave length of 10,000 metres is about 80 per cent.

A special advantage of this wave generator is that it allows a great number of frequencies to be derived by a simple change of connections. Any finer gradation in wave length can be effected according to a special process.

Parliamentary.—ROYAL ASSENT.—The Royal Assent has been given to the following Acts:—

London United Tramways Act, 1911.
London Electric Railway Act, 1911.
Metropolitan District Railway Act, 1911.

SECOND AND THIRD READINGS.—In the House of Lords, on May 29th, the South Lancashire Tramways Bill was read a second time, and the Brighton, Hove and District Railless Traction, and the Metropolitan Electric Supply Co.'s (Acton District) Bills were read a third time.

In the House of Commons, on June 1st, the Bristol Tramways Bill was read a third time.

Electrical Smelting of Iron.—The Iron Works Society, in its last report concerning the experimental reduction of iron at the Trolhattan Waterfalls, states that the electrical plant, which has cost £17,800, commenced work on November 15th, 1910. The Special Commission for the experiments states "that the results obtained, without doubt, justify one in assuming that the reduction of iron by means of electrical furnaces is already solved even from an economical point of view. But at the same time, it has transpired that better results are to be expected if arrangements are made for maintaining, under all conditions, a more effective circulation of gas, and there are great prospects of this improvement being effected." The Board of Waterfalls has offered, under certain conditions, to furnish at the most 6,000 H.P., and simultaneously to reduce the price during the first 10 years to 40, and for the subsequent 10 years to 45 kr. (£2 10s.) per KW., after which interval the charge is to be increased to 50 kr. per KW.

Copper.—Visible supplies have experienced considerable withdrawals during May (1911), the end of that month finding them at 72,613 tons, or a decrease of 5,455 tons. The average decrease per month for the preceding 12 months, as shown by Messrs. Merton's circular, has been about 2,400 tons.

The above decrease in European visible-supplies is made up of 4,006 tons less in English ports, 725 less afloat from Chile and a similar drop in the quantity from Australia. Against this, the stock at Havre is only 1 ton better. Stocks in Rotterdam are up 50 tons, and Hamburg is estimated to have increased 1,000 tons.

With regard to supplies, those from North America to this country, and to Europe generally, are well above the average. From Spain also the supplies are strong. Chile shipments are a couple of hundred tons low, but Australian are some 800 better than the average for the previous 12 months. Deliveries are 46,659 tons, the highest this year.

American supplies continue to increase, the figures being from the American Producers' Association. The end of April shows an increase of 1,584 tons over March, and these supplies are now higher than they have been since last August.

Combined supplies, however, are 2,615 tons less for the end of April than for March.

Turbo-blower.—In our last issue (page 878) in referring to the inspection of a mixed pressure turbo-blower at the Westinghouse Works, Trafford Park, which took place recently, our correspondents inadvertently gave the capacity of the blower as 25 cb. ft. of free air per minute; the figure should be 25,000.

Sports.—The third annual athletic sports meeting of the employés of the Hart Accumulator Co., Ltd., are to be held to-morrow, Saturday, commencing at 2.15 p.m., at the Memorial Athletic and Cycle Grounds, Canning Town, E.

Appointment Vacant.—Distributing superintendent, for the Sunderland Corporation Electricity Department (£182). See our advertisement pages in this issue.

(*Continued on page* 928.)

ELECTRICAL ILLUMINATIONS FOR THE CORONATION.

THE POPULARITY OF ELECTRICITY.

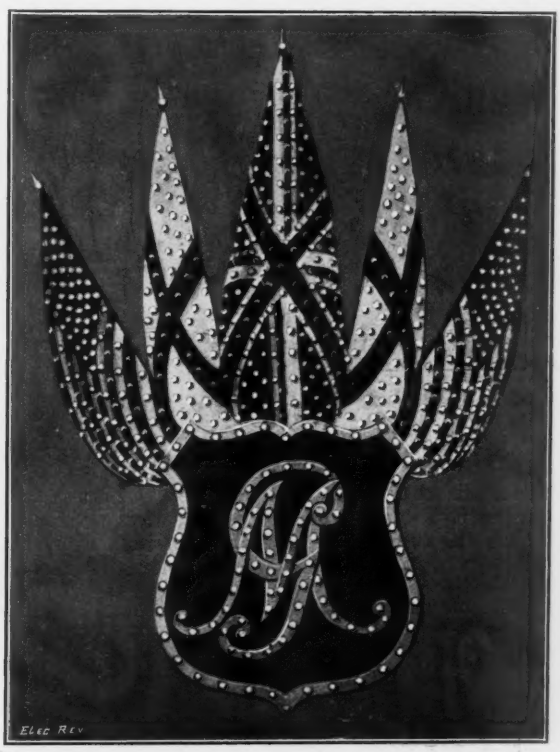
Temporarily, London is not London. It is years since the great metropolis was in such complete submission to the cleaners, the painters and the carpenters. Everywhere there are the signs of a people in the throes of preparing to "Coronate." The noise of motor-omnibuses hastening their pace to reap the biggest harvest they have known of sight-seers' coppers, has been for some weeks accompanied by the familiar sounds of tumbling timber, of the hammer and the saw.

But all this was only the merest preliminary—the electrician and the gasfitter, the festooner and the general beautifier, these were to follow. A tour of the Royal routes 10 days ago was quite too early to show the work of the electrical illuminator. Abundance of timber wherever there was space upon which to erect stands to let at so many guineas a seat—chiefly that, and little more. The first stage had not then been passed, but a few days made a remarkable difference and the electrical wireman is now in evidence; during the past week his services have been in great demand, but a heavier pressure still is now being experienced, and work will proceed practically continuously by day and by night for the next fortnight. Indeed, a week and more before these lines were due to appear in print some of the firms who laid themselves out to execute electrical illumination and decoration schemes were so heavily booked that they could undertake no more work.

Though the electrician was necessarily later than the rest in coming into public view with his conduits and battens and miles of strip, indoor preparations had been in progress for many months. That the demand for electrical material would be large was recognised in good time by those who had carefully watched the advance of electrical illumination in the public favour since the Coronation of King Edward VII in 1902. The fact that the days of the celebration are

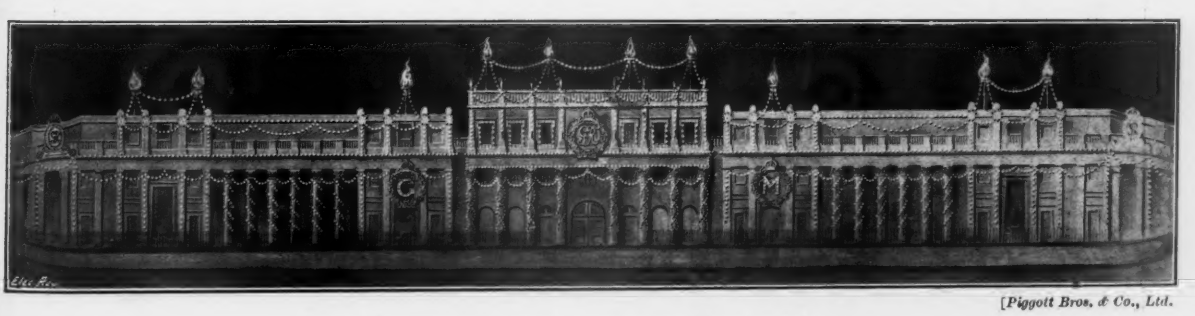
[*Duncan Watson.*

Device for the Royal Colonial Institute



[*Duncan Watson.*

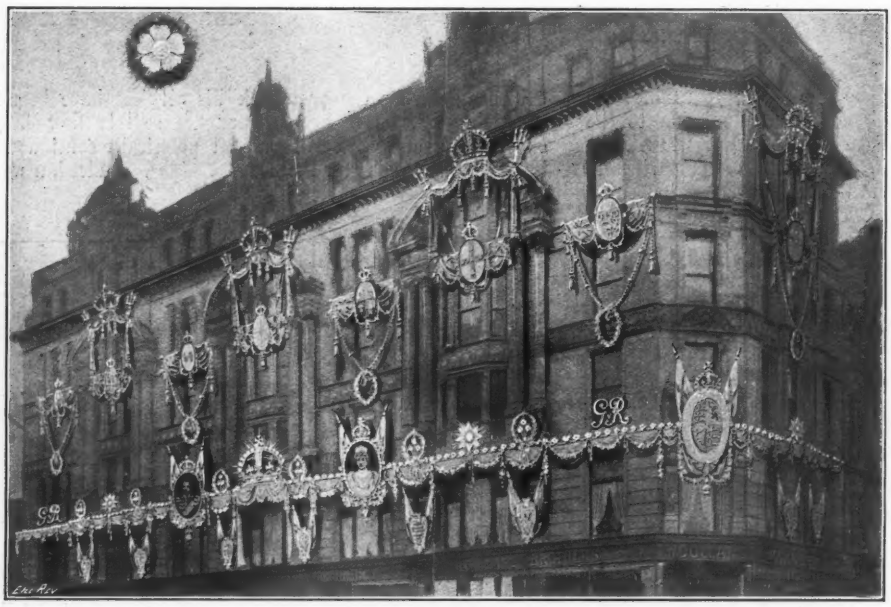
American Embassy Device.



[*Piggott Bros. & Co., Ltd.*

The Electrical Illuminations of the Bank of England.

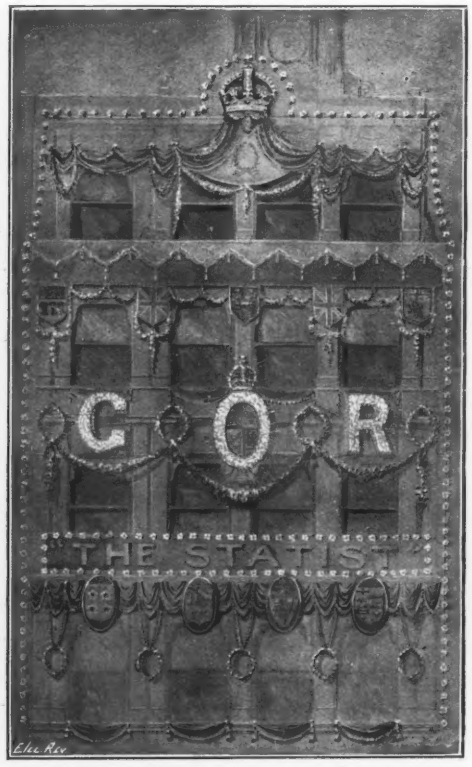
the longest in the whole year, leaving the hours for effective illumination displays at a minimum, may make the demands on electricity works a comparatively small matter, does not reduce the chances of good turnover for firms whose business it is to make or sell electric devices, &c., for consuming the current, nor the volume of work required of the contractor and his men; these are essential, be the illuminating hours many or few. The demand upon the stocks in our electrical warehouses and stores, heavy as it has already been, is hardly likely to fall during the coming fortnight.



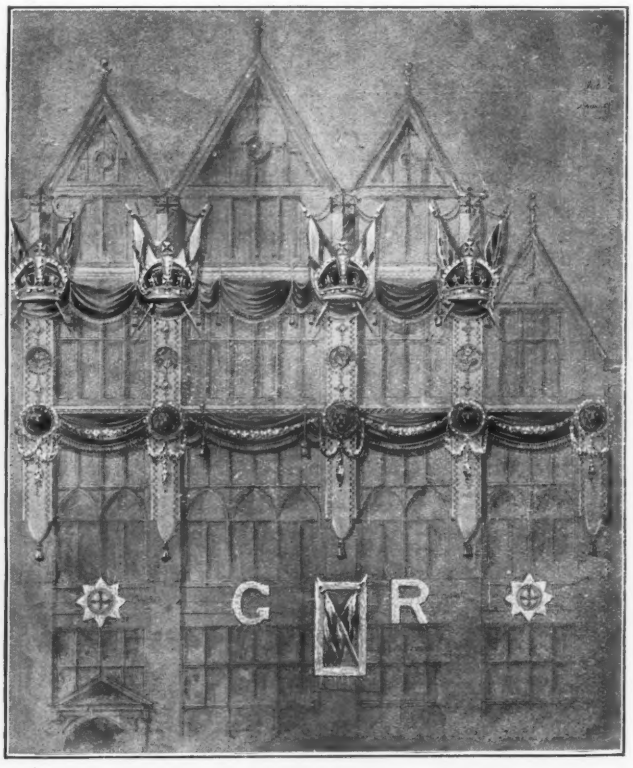
Messrs. Woolland's Premises at Kensington. [Siemens.

We have had the pleasure of observing the activity in some of the factories devoted to the production of the royal letters, crowns, and multitudinous other devices and signs which will shortly be placed in position on important buildings along the route, and while being interested in the manifold operations included from the birth of the design in the mind of the artist to the finishing touches and draping and switching on of the electric current to show the beautiful effect of the lamps of national colours, we have also been convinced that the enterprise displayed will be well rewarded both in the profit on the business done and in the appreciation to which the throngs of London will give unstinted expression a fortnight hence.

Electricity has won easily in this matter of choice illumination effect, by reason of its safe adaptability amid inflammable decorative surroundings, as well as owing to the convenience with which it enables a complete scheme, silently, ladderlessly and without taper, to suddenly shine out in all its beauty. The labour involved in lighting



"The Statist" Building. [Siemens.



Cox's Bank at Charing Cross. [Siemens.

up the front of a great building with myriad gas jets, and the unedifying spectacle that the operations afford the crowds who are out to see the *illuminations*, not to spend hours viewing "*lighting up*," needs little reference here. Electrical men know it well enough already, let the public observe and remember it too. For after all, what electricity is doing on a large scale in the streets is but an illustration of its convenience and adaptability in every home and every seaside and holiday and recreation resort in the kingdom. If we mistake not, electricity is going to make a most winsome and graceful appeal to the public, and a grand imposing display worthy of so great an occasion as the Coronation of King George V.

A feature that is noticeable where production of decorative signs has been proceeding is the intention to make them

B.T.-H. CROWN.

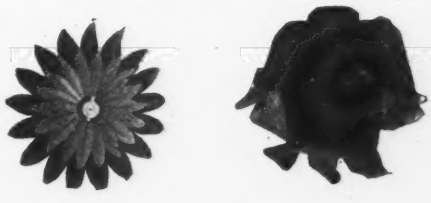
B.T.-H. STRIP.

beautiful in their daylight and sunshine aspect, and twice beautiful in their night effect when electricity puts life into every detail. We have seen a number of examples of these devices ready to leave the factory to take their positions on some of the best-known hotels and other public buildings, and we say without any hesitation that they will in both day and night effects be a credit to the buildings they adorn.

There are already evidences that one of the finest centres from an electrical standpoint will be the very heart of the City of London. Here, we believe, the testimonial to electricity will be practically unanimous. The Old Lady of Threadneedle Street was up earliest of all putting on her electric strip attire, the Royal Exchange is being choicely outlined and festooned with similar material which is also entwining the pillars of both of these fine and stately edifices; the Mansion House, and contiguous banks and insurance buildings are also following suit as we write, while Lombard Street, with its bankers' co-operative scheme for a dozen electrically-illuminated and choicely-decorated arches, and festooning on the buildings on either side for the full length of the thoroughfare, is also in the hands of the electricians. A few steps further, and London Bridge has a story of its own to tell. Who said gas? It is true that the gas pipe festooning and jets had been fitted along either side, reminding one of other days; but wisdom has had her way just in time, and London Bridge will be illuminated electrically. If we had known when those gas pipes were to be taken down we would have been there to see—and take a photograph; but there, perhaps it will be better not to prolong the agony. What more can we desire than a complete testimonial to the merits of electricity? Only one thing, and that the leaving of the gas pipes in position for electric strip to entwine about them. That would have been a most entertaining picture for many a day to come!

We observe that a daily newspaper, in investigating the progress of illuminating schemes last week, had interviewed one of the well-known firms which has undertaken many contracts, and its spokesman impressed upon his interviewer that it "was so easy to carry electric wires anywhere," and that "with a few switches you can control any number of lights," while with gas "you have to light every jet on a straight line, and each device separately." A gas advocate says that electric lights are "dead lights"—"too steady and fixed," but he quite admitted "the extra trouble in lighting up," though he thought it worth it. He wants a breeze, that is all, and gas is perfection. But the same paper has also interviewed the well-known firm of James Pain & Son, whose name, like that of Piggott Bros., is everywhere just now. What do Pains say? Ten days ago, they had about 200 schemes in hand, using gas for one-third and electricity for two-thirds! The electrical schemes will use about 300,000 lamps of 5 and 8 C.P. We will be on the watch for that "dead effect" of the electric lights when the breeze causes a gentle rustling among the festoons and flags as the white and coloured lights play upon them, and we will see if our gas advocate be not a little erring; and we will watch the old "lamp-lighter" as he goes steadily with his wand from jet to jet, giving us a line here and a line there, until the whole is complete; also will we observe with interest the distance of festooning flowers and flags from the

G.E.C. CROWN.



G.E.C. FLORAL FITTINGS.

G.E.C. LANTERN.

gas danger zone; then studying the *pros* and *cons* we will revise our own opinion—if reason demands it.

But we must not longer linger upon general contemplation or preliminary considerations, however interesting the subject—we must descend to details. In the following notes we give a few particulars of representative work that is being done by several of the firms who are more prominently engaged upon electric illuminations.

Hampstead Borough Council's Electric Kitchen. (See p. 927.)

The Bank of England, when finished, will appear as in the design on p. 923, for the photograph of which we are indebted to Messrs. Piggott Bros. & Co., Ltd., of Bishopsgate, E.C., who are carrying out this most excellent undertaking. Altogether, this design includes 5,000 carbon lamps of 8-c.p. Three special supply mains have been put in by the City of London Electric Lighting Co. to feed four main circuits, two on each side of the three-way system. There are 86 sub-circuits controlled from D.P. watertight distribution boards, with an average of about 50 lamps each. The special devices, which are shown, comprise three 20-ft. golden wreaths modelled in high relief, embodying the national emblems (rose, shamrock and thistle) each of the wreaths being surmounted by a representation of the Imperial crown. There are 16 8-point stars arranged in four groups along the top coping, whilst two large oval medallions encircling the King's cypher are mounted on scroll work at the ends of the front façade, with the Imperial crown above. Ten electric flambeaux are fixed on the top of the Bank, from which depend graceful festoons of lamps. The whole of the Corinthian pillars are entwined with lights, the only colour employed for this part of the scheme being white-tipped lamps with ruby centres. Indeed, this arrangement forms the character of the main outlining, varied only in the case of the centre windows and cornice above the portico, where the reverse effect will be obtained by means of ruby-tipped lamps and white hearts. All the devices referred to in the foregoing will be lit with amber lamps, and the lamps on the strip will be fitted with white-petal floral reflectors. Messrs. Piggott Bros. are, of course, also engaged upon many other buildings, among the more important to be electrically fitted by them in the City being the offices of the Mutual Life Insurance Co., of New York, Messrs. H. S. King & Co., the London and Lancashire Insurance Co., in Cornhill, the Union Castle Line, in Fenchurch Street, the Provident Association in London, and several branch offices of the L. and S.W. Bank. They are also decorating the whole of the various offices of the L.C.C. in Spring Gardens, Cockspur Street, Charing Cross, Fleet Street, Strand, &c., including Cannon Street Fire Station.

Among other firms who have been very actively engaged for some time past booking orders for Coronation electrical schemes are Messrs. Siemens Bros. Dynamo Works, Ltd. All their installation work has been or is being sublet to electrical contractors, and the buildings will be decorated with crystal glass and wooden devices, including garlands, festoons, and "Bro-ite" strip, shields and emblems, flags and trophies. The Piccadilly Hotel will form a very fine example of their work, the illumination being all-electric making use of some 3,500 ft. of "Bro-ite" strip and about 4,200 carbon-filament lamps in red, white and blue. The main pillars of the building are being outlined alternately in red lamps, white lamps and blue lamps. There will be a number of 5-ft. flambeaux, whilst in the centre of the building, at each side, there is a large illuminated crown. It is estimated that the load will be 160 kw. The fine corner premises of Messrs. Woolland Bros., at 95, Knightsbridge Road, will be another of Siemens's installations, and a general idea of the scheme as it will appear is shown in one of the accompanying illustrations. There will be approximately 400 ft. of "Bro-ite" strip with 650 carbon-filament lamps in assorted colours; two large crystal glass medallions with Royal quarterings each electrically illuminated; and one 6-ft. illuminated wooden crown in gilt and shaded finish. Further, there are to be four 4-ft. cut crystal glass stars, electrically illuminated, five 4-ft. and nine 2-ft. crowns unilluminated. A couple of illuminated transparencies of their Majesties the King and Queen respectively, will be surrounded by a canopy of blue and gold drapery.

Hampstead B.C. Electrical Showroom. (See p. 927.)

There will be 10 sets of shields with flags and tridents and nine Colonial ovals, and the complete line of lights will have neat floral attachments. In addition to this, there will be 12 large gilt wreaths with central floral illuminations. It is estimated that the load for this building will be approxi-

mately 24 KW. Another of our pictures shows the premises of the *Statist*, at 59, Cannon Street, E.C., as they will appear when finished. This building will be outlined with about 400 ft. of Bro-ite strip and 500 carbon-filament lamps in assorted colours. The face of the building will be decorated with flower garlands containing concealed lamps, and the devices will include five shields, four Colonial ovals, and in the centre of the building a large cut crystal glass medallion, together with two crystal letters, G and R respectively. The drapery will be blue and gold, relieved with silver and with bullion fringe. It is estimated that the load will be about 16 KW.

Cox's Bank, at Charing Cross, also shown by us, is a purely decorative scheme, and will include crowns, banners, 6-ft. flag trophies, together with a special framed illuminated crystal device embodying crossed flags. Two 4-ft. crystal glass stars and crystal glass letters G.R., also illuminated electrically, are employed on the building. There will be approximately 150 lamps, and the load is estimated at about 5 KW.

Among other buildings for which Messrs. Siemens Bros. Dynamo Works, Ltd., will be responsible, are the following :—

Messrs. Mann, Crossmann & Paulin, Whitechapel, E.; the R.M.S.P. Co.'s premises at 57 and 18, Moorgate Street, E.C., and 32, Cockspur Street, S.W.; Messrs. Pimms, 35, Poultry, E.C.; the Commonwealth of Australia, 72, Victoria Street, S.W.; The Blind Beggar, Whitechapel, E.; Gramophone, Ltd., City Road, E.C.; Messrs. Brown, Shipley & Co.'s premises in Pall Mall, S.W., and at Founders' Court, Lothbury; The Britannia, Cambridge Road, E.; Messrs. Williams, Deacons' Bank premises at Victoria Street, S.W., Cheapside, E.C., and Cockspur Street, S.W.; the Shoreditch Town Hall; Messrs. Drews, Piccadilly, W.; the premises of the Commercial Union Assurance Co. at 27, Cornhill, E.C., and in Pall Mall, S.W.; Kensington Town Hall and Kensington Library; North Kensington Branch Library, S.W.; Kensington Baths, S.W.; Carreras, Ltd., Arcadia Works, City Road.

At the beginning of this article we show two striking electric designs which have been made in the West End of London for the Royal Colonial Institute and the American Embassy. Messrs. Duncan Watson & Co., electrical contractors, &c., of Berners Street, W., who have during the past year been engaged upon an entire rearrangement and concentration of their business in a large building which is well laid out and equipped both from the showroom and commercial standpoints, as we were able to see for ourselves on the occasion of a recent inspection of the premises, have also taken a much larger building a few streets away wherein actual electrical manufacturing work is in progress, and very large storing accommodation is available. It was more or less of a revelation to us to find so busy a hive of electrical activity right in the heart of the West End. What was once a mineral water manufactory has been transformed, and at the time of our visit quite a number of departments were engaged at high-pressure producing devices such as we now illustrate, and also the Royal Letters. Electrically-driven wood-working tools cutting out ground-work to shape preliminary to the painting, electric wiring up and draping, a shop for rewiring armatures and doing all sorts of electrical operations, a lamp store for storing lamps by the hundred thousand, a conduit and fittings store of considerable dimensions, these and many other departments form part of the organisation. The schemes are evolved by Messrs. Duncan Watson's artistic and designing staff at Berners Street, either to the orders of, or for the approval of, the firms or persons for whom the work is to be carried out. The firm's Coronation schemes are very numerous, and include the Royal Exchange, the Royal Colonial Institute, London Bridge, the American Embassy, and many others, to some of which we may refer later.

The device for the Royal Colonial Institute, which was manufactured by Duncan Watson & Co., is, in reality, the crest to be found on the Club notepaper, which has been reproduced minutely in every detail. It will be noticed that there are two Union Jacks across the trident, which are encompassed by the Garter, surmounted by a crown. It will be observed that the letters are studded with tiny lamps. The whole device is beautifully coloured in a fully representative sense, and, in our opinion, may be described as most effective and highly successful. The same firm has made for the American Embassy, a device which it is believed will be among the most interesting exhibited this year. It will be fixed at the Embassy in Park Lane, and comprises a huge shield, coloured in royal blue, surmounted by a heavy edging of gold, with monogram "G.M." fixed in the centre, also in gold. Above the shield are five flags, American and English entwined, beautifully studded and picked out in coloured lamps. The device is 20 ft. high and weighs over half a ton. From start to finish, it will have taken six weeks to manufacture, and the whole device has been made at the Duncan Watson new works already mentioned, and which are more fully dealt with in our "Business Notes" to-day. Two other devices are to be fixed on the American Embassy, one being representative of the American Eagle embossed in gold, and lighted up from 70 concealed lamps. The other device is the Royal Arms, which is also surrounded by a frame and illuminated by concealed lights. The total number of lamps in connection with the Embassy scheme of lighting is about 4,500, in various colours.

B.T.-H. Coronation Devices.

THE BRITISH THOMSON-HOUSTON CO., LTD., of Rugby, are just now making a special feature of certain lines of manufactures for the purposes of electrical illuminations. A stock of multi-coloured collapsible and non-inflammable lanterns, special illumination strip for exterior lighting, and a variety of script letters in 24 in. and 36 in. sizes with 30 and 42 B.C. lamps, also monograms "G.R." in white, illuminated with 50 B.C. lamps wired in parallel, are among these lines. We show the B.T.-H. illumination strip on page 925. It consists of twin cables 7/22 S.W.G., and is supplied with 60 holders placed either 6, 12 or 18 in. apart. We also illustrate one of the firm's effective crown designs such as are supplied in 24 in. and 36 in. sizes for 28 and 50 lamps respectively. These crowns are made of white wood, carved and painted correctly to heraldic design, finished in six colours, and enamelled. The trade can ascertain full particulars of these and other manufactures from the firm's special "Coronation" list.

G.E.C. and the Coronation.

We have already directed the attention of the trade to the GENERAL ELECTRIC CO.'s catalogue, in colours, of designs and manufactures for the Coronation illuminations, but the illustrations appearing on page 925 show some serviceable lines in electric crowns, floral electric shades, and other decorative devices, such as will, no doubt, be the objects of record demands from now right up to the eve of the Royal processions.

The company have, as might naturally be expected, been doing extremely good business in Coronation lines, and they are still exceptionally busy with orders. No doubt this will continue in the case of smaller and more popular lines, but it is now of course too late for the company to accept any further orders for the more elaborate devices contained in their special catalogue. It goes without saying that the demand has been far in excess of that experienced for electrical material on any previous similar occasion of national rejoicing. Many hundreds of thousands of feet of G.E.C. "Pixielite" strip have been sold, and large supplies have found their way to all parts of the British Empire.

Coronation Supplies.

THE SLOAN ELECTRICAL CO., LTD., of Conradty House, 12, Golden Lane, London, E.C., have a very large stock of insulators, "Philips" carbon-filament lamps, and electric cables suitable for Coronation work, of which they can give prompt delivery.

THE ELECTRICAL CO., LTD., 122-124, Charing Cross Road, London, W.C., are making a special offer to the trade of their "Series" Striplite for outlining windows, forming letters, &c., also parallel strip, carbon-filament lamps, and crowns and letters, for Coronation and any other temporary outdoor lighting. The "Striplite" is supplied with porcelain holders 5 in. apart, supported by flexible metal bands, complete with 2-C.P. 14-volt pear-shaped lamps, clear, frosted, or coloured.

MESSRS. SIMPLEX CONDUITS, LTD., of Garrison Lane, Birmingham, have issued a card announcing to the trade special net prices of coloured lanterns for the Coronation, of which they can give immediate delivery. They are supplied in various colourings for electric lamps or for wax candles, and are in two sizes, No. 1, 4½ in. × 4½ in., No. 2 6 in. × 5½ in.

The Chelsea Co.'s Illuminations.

The decoration and electrical illumination of the premises of the Chelsea Electricity Supply Co., Ltd., have now been completed by MESSRS. W. SEYMOUR & CO. The effect can be observed every evening from now until after the Coronation from 8 to 11 o'clock p.m.

HAMPSTEAD ELECTRIC SHOWROOMS.

LAST week, on the invitation of the Borough Council, we paid a visit to the new showrooms which have recently been opened by the electricity department, at 283, Finchley Road, to witness a demonstration of cooking by electricity. We give on the opposite page views of the kitchen equipped for this purpose, and of the

showroom on the ground floor; the latter has been furnished with a wide variety of cooking, heating, lighting and other electrical apparatus, and having the advantage of a prominent and attractive frontage with large windows, is admirably calculated to arrest the attention of the passer-by—particularly when, as on the occasion of our visit, charming laundresses are engaged in demonstrating the pre-eminent virtues of the electric iron. The nature of the exhibits will be gathered from the illustrations, and we have no doubt that the showrooms will prove of great service in propagating the use of electricity in the households of the borough.

The cooking demonstration was performed by Mr. F. S. Grogan, who incidentally demonstrated the advantage of an engineering training to a lecturer on the art of cooking, for his lucid explanations of the scientific principles involved, and of their bearing upon the attainment of economy of energy combined with culinary efficiency, were not the least interesting features of the occasion. The "Tricity" apparatus was used, and the readiness with which the most delicate operations could be performed, as well as the ordinary functions of ovens and grillers, &c., with this type of apparatus was clearly shown. The leading features of the "Tricity" system are the use of the "hot-plate" for boiling, grilling, toasting and baking, and the application of the principle of heat retention by highly reflecting surfaces. The oven is made of light material with a bright surface; the metal has only a small capacity for heat, so that the interior quickly arrives at the working temperature, and the loss by radiation and convection is small. The consumption of energy is remarkably low; it enables electricity to compete with gas for cooking even on the score of cost alone, apart from the extreme convenience and cleanliness of electrical cooking apparatus. The demonstration was both interesting and instructive, and we are convinced that if a well-organised campaign is carried on, and if prospective customers are actually *shown how* such apparatus does its work, its use will soon be greatly extended, particularly in such a locality as Hampstead. We hope that supply engineers will realise the enormous possibilities open to them in this direction; where there are no factories to provide an off-peak load, electric cooking may largely take the place of motive power, if a suitable tariff is offered. We do not share the fears of those who suggest that the load may become too heavy to be welcome—that has not occurred in the case of any other class of load, and we hold that if the demand assumed unexpectedly large proportions, it would pay to take the necessary steps to cope with it. There is plenty of room for expansion.

NOTES.

(*Continued from page* 922.)

The Johannesburg Gas-Power Plant Litigation.—In the Court of Session, Edinburgh, on Tuesday, says the *Times*, Lord Ormidale began the hearing of evidence in this action between the Municipal Council of Johannesburg, Messrs. D. Stewart & Co. (1902), Ltd., William Beardmore, and the representatives of the late Joseph Beardmore for sums amounting to over £400,000 in respect of the defendants, Messrs. Stewart & Co., having, as it was alleged, failed to complete contracts for the installation of engineering and electrical plant at Johannesburg. Messrs. Stewart, who maintain that the matter should be dealt with by arbitration, deny breach of contract, and allege that the installation was made according to the specification of the plaintiffs, and that the failure to reach the prescribed tests was due to the unsuitability of the coal. The defendants Beardmore were guarantors, their liability being limited to £115,134. The *Times* says that the action is expected to last over three weeks.

White-light Arc Lamp.—A new arc lamp giving a white light has been shown before the French Academy of Sciences by M. E. Roux. The electrodes are tungsten for the positive and mercury for the negative; the arc burns in an atmosphere of inert gas, or *in vacuo*, with a length of about 5 mm. The lamp consumes 0·45 watt per C.P. with a potential difference of 13 volts.

Institution and Lecture Notes.—RONTGEN SOCIETY.—A paper on the photographic action of electrical discharges in air at a pressure below that of the atmosphere was read by Mr. C. W. Raffety, F.R.A.S., at the meeting on June 1st. The illustrations with which it was accompanied were obtained by the ordinary method of using an induction coil, one terminal of the secondary winding being connected with a metal point brought down centrally on the sensitive film, and the other terminal being joined to the metal plate upon which the photographic plate rested. When the point electrode in contact with the film was positive, Mr. Raffety found that the size of the spark increased rapidly as the pressure was reduced. The filaments lengthened and broadened, and each of them retained its own individuality, proceeding in its course unaffected by intersection with another. With pressures below 100 mm. a glow type of discharge began to appear, and the vigorous point-to-plate discharge ceased. The transitional condition, in which the plate was in a continual glow, was well shown in a photograph taken when the pressure was 38 mm. Negative discharges at atmospheric pressure had the characteristic palm-leaf structure, but with a state of increasing vacuum this gave way to a crab-like appearance with a curious sickle formation, which reappeared continually. The positive discharges might, indeed, be likened to spiders and the negatives to crabs. The discharge did not appear to take place through the substance of the film, but above its surface.

ASSOCIATION OF TEACHERS IN TECHNICAL INSTITUTIONS.—The fifth annual conference of the Association took place at Southport on Monday and Tuesday this week. The president stated that the membership already included over half the full-time technical teachers of England, and a large percentage of the part-time teachers.

THE CONCRETE INSTITUTE.—On Wednesday and Thursday this week the summer meeting and first annual dinner of the Institute took place; papers were read on the æsthetic treatment of concrete, testing of concrete and materials therefor, &c., and a report on the standardisation of drawings of reinforced concrete work was presented. Visits were paid to important new buildings, and last night a conversazione was to be held in the galleries of the Royal Institute of British Architects. The membership of the Institute is now approaching 1,000.

THE FARADAY SOCIETY.—On Tuesday, June 13th, at 8 p.m., Prof. Ernst Cohen, of the University of Utrecht, will give an illustrated lecture before the Faraday Society on "Allotropic Forms of Metals." Applications for tickets should be made to the Secretary, 82, Victoria Street, London, S.W.

ASSOCIATION OF MINING ELECTRICAL ENGINEERS.—The closing meeting of the session of the Notts. and Derbyshire Branch of the Association was held on May 26th. The secretary, Mr. F. Cusworth, of East Kirkby, reported that there was a total membership of 66, and a balance in hand of £8. Mr. W. Maurice, Hucknall, was elected president, and Prof. Robinson, Nottingham, vice-president.

PHYSICAL SOCIETY OF LONDON.—A visit to the National Physical Laboratory took place on May 26th, 1911. All departments of the Laboratory were thrown open for inspection, and a number of special demonstrations had been arranged.

Gas Engines Superseded.—So popular has electricity become in Strasburg, Alsace, as a means of motive power, that it is stated in a German contemporary that not a single gas engine has been laid down in the town during the past 10 years.

Conference on the Education and Training of Engineers.—We have received a copy of the programme of the conference convened by the Institution of Civil Engineers, to which we have already referred, for Wednesday, June 28th, at 10 a.m. The conference will be opened in the theatre of the Institution, Mr. Alexander Siemens, President, being in the chair. At 10.30 a.m. sectional meetings of the conference will commence. Mr. Anthony G. Lyster will preside over a joint meeting of Sections I and II, and after opening remarks by the chairman, discussions will take place on: "The extent to which mathematical and scientific subjects should share with other subjects of literate education the attention of schoolboys who intend to enter later the engineering profession" (introduced by Dr. J. Gow and Prof. Silvanus Thompson); and "The question of specialised entrance examinations for university or college courses of study in engineering science with a view to the curricula to be followed, and also of the inclusion in the latter of courses in modern languages" (introduced by Prof. A. K. Schwartz). Section III will be opened by the Chairman, Mr. R. Elliott-Cooper, and there will be discussions on "The requirements of practical training and of scientific study and the apportionment of time to them" (introduced by Mr. A. F. Yarrow and members of his staff, and Mr. W. H. Allen); and "Practical training in workshops or on works of construction, with special reference to training in the engineer's office" (introduced by Mr. W. B. Worthington and Mr. H. F. Donaldson). On the following day Sections II and III will hold a joint meeting under the chairmanship of Dr. W. C. Unwin, for the discussion of "The relation of engineering employers and colleges from the point of view of the practical training of college students" (introduced by Prof. J. E. Petavel and Mr. J. W. Horne), and afterwards Section II will discuss "The value of a university degree in engineering science in relation to professional competence" (introduced by Prof. S. M. Dixon and Prof. C. F. Jenkin), and "The position and uses of engineering laboratories in relation to education at college" (introduced by Prof. W. E. Dalby, Prof. John Goodman, and Prof. Bertram Hopkinson), while in Section III discussions will take place on "The relation of practical training to college study; whether, or to what extent, before, sandwiched, or after its conclusion" (introduced by Prof. Archibald Barr and Prof. Henry Louis), and "Workshop training as a preliminary to practical training in other branches of engineering" (introduced by Mr. John A. Brodie, Mr. J. Mitchell Moncrieff, and Prof. J. J. Welch. The Conference will close at 1 p.m. It is to be regretted that the dates should have been chosen so as to clash with those of the Convention of the Municipal Electrical Association (which were fixed months ago) as no doubt many members of the M.E.A. would like to be present at the Conference.

For Sale.—The South Shields Corporation has for disposal two triple-expansion open-type marine engines, with condensers, &c., each coupled to a 2,100-volt, 50-cycle alternator. See our advertisement pages to-day.

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the ELECTRICAL REVIEW *posted as to their movements.*

Central Station Officials.—The recommendation that the salary of MR. J. R. P. LUNN, the engineer and manager of the Electricity and Light Railways Departments of the Darlington Corporation, be increased to £600 per annum, by three annual increments of £50, was confirmed by the Council on 1st inst.

MR. A. G. LOW, late switchboard attendant at Tynemouth Corporation electricity works, has been appointed switchboard attendant at the Newcastle and District Electric Lighting Co.'s *Chronicle* Office sub-station.

Tramway Officials.—MR. A. E. DOUGLAS, car repairer, Dee Village Works, who has been in the Aberdeen Corporation tramway service for 17 years and is leaving for Canada, and MR. JAMES RAE, motorman, received parting gifts from the tramway employés. Mr. Pilcher, the manager, made the presentations.

General.—MR. L. W. BALLARD, who has recently been engaged with the British Westinghouse Electric & Manufacturing Co., has been appointed assistant engineer on the staff of Messrs. May & Hawes, consulting engineers, of Westminster.

We regret to record that PROF. D. CAPPER, Professor of Engineering at King's College, was thrown from his horse in Rotten Row on Tuesday afternoon. He was taken, in an unconscious condition, to St. George's Hospital, and was found to be suffering from a fractured skull.

We understand that MR. OSCAR BEABEY, late of the São Paulo Railway, Brazil, has been appointed telegraph engineer to the Buenos Ayres and Pacific Railway.

The marriage took place on June 1st at Old Trafford of MR. CYRIL GRIMES, purchasing agent to Messrs. Royce, Ltd., electrical engineers and crane makers, Manchester, to Miss Elizabeth Harrison Lawton of Stretford.

Obituary.—MR. WILLIAM LYND.—We deeply regret to learn of the death of an old friend in the person of Mr. W. Lynd, which occurred at his home at Kennington on Wednesday night last week. Mr. Lynd, who was 67 years of age, was, we believe, Edison's first representative in this country. He was very capable as a lecturer and demonstrator of electrical and other scientific subjects, concerning which he was able to interest large audiences in different parts of the kingdom, being possessed of both a sufficient technical knowledge and the ability which in a popular lecturer appeals successfully to the public. He had a good deal to do with bringing the phonograph, and later Marconi wireless telegraphy, under the notice of the uninitiated. As an instructor of technical telegraphy and of wireless telegraphy he was an expert, and for a time he conducted, with others, a School of Telegraphy in London, He was a man of very varied knowledge, for as well as his scientific reading, writing and lecturing, he was not wanting in knowledge of English literature and musical literature, while he was the author of several publications, among them being one on the "Practical Telegraphist," and another on "Ancient Musical Instruments." Unfortunately, with all his pursuits, he was not successful financially, and during the past few years this circumstance had not eased his lot. For the past two months he has been laid aside with cardiac dropsy, and a stroke of paralysis occurred five days before the end came. As amongst those who remember his heartiness, his vivacity, his readiness to converse on almost any subject, his great good nature, and his willingness to assist in charitable objects, devoting time and apparatus thereto without fee, we desire to tender to his sorrowing widow and five daughters our sincere sympathy with them in their loss; we do so the more profoundly, knowing that a life that has been so full of interest and worthy effort has been terminated without any chance of making provision for those whom he has left behind.

MR. J. W. BOUCHER, A.I.E.E., aged about 55, District Superintendent, South and West of Ireland, of the Edison & Swan United Electric Light Co., Dawson Street, Dublin, shot himself dead in his office last week. He suffered greatly from rheumatism, and, according to his custom, was driven to the office in a cab, arriving there shortly after noon. At 4.50 p.m. a book-keeper and typist heard a shot in his room, and a clerk, on entering, found Mr. Boucher sitting dead in an armchair, with his head bent over a writing-desk. In his forehead there was a bullet wound from which blood was flowing, and the thumb of his right hand was on the trigger of a six-chambered revolver which lay on the desk; one chamber had been discharged, and another was still loaded. In a press in the room there was found a second revolver with cartridges, and also a box containing 43 cartridges for use in the revolver which had been fired. At the inquest the jury returned a verdict of "Suicide during temporary insanity."

MR. E. W. P. WARBURTON.—The death occurred on May 31st of Mr. Edmund Watkin Piers Warburton, electrical engineer to the Ebbw Vale Steel, Iron and Coal Co., Ltd. He was only in his 26th year.

NEW COMPANIES REGISTERED.

Shackleton's, Ltd. (115,880).—This company was registered on May 17th, with a capital of £2,000 in £1 shares, to carry on the business of manufacturers of and dealers in bricks, tiles, pipes, pottery and earthenware, paviors, manufacturers of and dealers in artificial stone, builders, electrical engineers, &c., to acquire the business carried on by C. W. Shackleton, at Polesworth, Warwick, as the Polesworth Electrical Appliances Co. The subscribers (with one share each) are:—C. W. Shackleton, Laurel Cottage, Tamworth, manufacturer; D. R. Galloway, 47, Temple Row, Birmingham, chartered accountant. Private company. The directors are to number not less than two or more than five. C. W. Shackleton is the first managing director. Registered office, 47, Temple Row, Birmingham.

Electric Bleachers, Ltd. (115,887).—This company was registered on May 18th, with a capital of £100 in £1 shares, to acquire and turn to account Patent No. 1,941 of 1911, and to carry on the manufacture of apparatus used in connection with bleaching. The subscribers (with one share each) are:—O. Sumner, 39, Victoria Street, Westminster, civil engineer; Mrs. E. H. Sumner, The Cottage, Netherton Road, Twickenham. Private company. The number of directors is not to be more that five; the subscribers are to appoint the first; qualification, one share. Registered office, 39, Victoria Street, Westminster.

Patent Series Lighting Co., Ltd. (115,997).—This company was registered on May 23rd, with a capital of £5,000 in £1 shares, to carry on the business of an electric light company in all its branches, &c., the subscribers (with one share each) are:—E. Booth, 9, Heath Villas, Halifax, solicitor; N. R. Booth, 9, Heath Villas, Halifax, solicitor; J. Hamer, 10, Broad Street, Halifax, electrical engineer. Private company. The number of directors is not to be less than two or more than five; the first are E. Booth and N. R. Booth. Registered by Jordan & Sons, Ltd., 116-117, Chancery Lane, W.C.

James J. Guest & Co., Ltd. (115,993).—This company was registered on May 23rd, with a capital of £20,000 in £1 shares, to adopt an agreement with J. J. Guest for the acquisition of the business of a mechanical and electrical engineer and manufacturer of grinding machines. The subscribers (with one share each) are:—W. N. Lindley, Llanaber House, Ford Street, Coventry, clerk; T. Longmore, 29, Church Lane, Stoke, Coventry, clerk. Private company. Table "A" mainly applies. Registered by Waterlow Bros. & Layton, Ltd., Birchin Lane, E.C.

Telephone Disinfecting Co., Ltd. (116,001).—This company was registered on May 23rd, with a capital of £2,000 in 1,980 ordinary shares of £1 each and 400 deferred shares of 1s. each, to carry on the business indicated by the title. The subscribers (with one share each) are:—F. E. Iles, 37, Edgeley Road, Clapham, S.W., articled clerk; A. J. Taylor, 7, Kenbury Street, Coldharbour Lane, S.E., clerk. Private company. The number of directors is not to be more than five; the first are C. E. Evans and A. E. Withers. Registered Office, Finsbury Chambers, 76, Finsbury Pavement, E.C.

A. L. P. Synd, Ltd. (116,021).—This company was registered on May 25th, with a capital of £20,000 in £1 shares (10,000 pref.), to construct, maintain and work tramways and railways in Buenos Ayres and La Plata, Argentine Republic. The subscribers (with one preference share each) are:—E. D. Such, 104, Lowden Road, Herne Hill, S.E., clerk; E. A. Symes, 80, Loughborough Road, Brixton, S.W., clerk. Private company. The number of directors is not to be less than two or more than five: the subscribers are to appoint the first. No qualification necessary. Registered by R. F. Yeo, 31 and 32, Budge Row, E.C.

Electro-Flex Steel Co., Ltd. (115,987).—This company was registered on May 23rd, with a capital of £25,000 in £1 shares, to acquire any inventions relating to electric furnaces, the electrical smelting of ores and the refining of metals, or to electric batteries, electro-chemical or electro-thermal processes, &c. The subscribers (with one share each) are:—J. H. Armstrong, 31, Mosley Street, Newcastle-on-Tyne, chartered accountant; F. S. Newall, Castle Hill, Wylam-on-Tyne, gentleman. Private company. The number of directors is not to be less than two or more than seven; the subscribers are to appoint the first. Registered office, 86, Collingwood Buildings, Collingwood Street, Newcastle-on-Tyne.

Engineering and Arc Lamps, Ltd. (116,030).—This company was registered on May 25th, with a capital of £3,000 in £1 shares, to take over the arc lamp manufacturing and engineering businesses carried on at Chingford and St. Albans, together with certain rights and properties connected therewith, and to adopt agreements (1) with the Gilbert Arc Lamp Co., Ltd., and (2) with J. S. Hecht. The subscribers (with one share each) are:—N. B. S. Leask, 153, Walm Lane, Cricklewood, N.W., clerk; H. S. Parlett, St. Margaret's, Cromartie Road, N., law stationer. Private company. The first directors are J. S. Hecht (chairman), C. E. Gilbert and W. J. Davy. Registered by Kenneth Brown, Baker, Baker & Co., Lennox House, Norfolk Street, W.C.

Associated Fire Alarms, Ltd. (116,004).—This company was registered on May 24th, with a capital of £160,000 in 60,000 preference shares of £1 each and 400,000 ordinary shares of 5s. each, to carry on the business of manufacturers of fire indicators, extinguishers, escapes and engines, and other implements and machinery, &c., and to acquire and amalgamate the undertakings of the Pearson Fire Alarm, Ltd. (incorporated in 1903) and the May-Oatway Fire Appliances, Ltd. (incorporated in 1907). The subscribers (with one share each) are:—G. H. Brown, 829, Salisbury House, E.C., engineer; J. Heal, 22, Hanover House, Regent's Park, retired merchant; E. W. Elliott, 22-26, Paul Street, Finsbury, E.C., general manager; H. C. Hall, M.I.C.E., 23, Albemarle Street, W.; A. Hair, 7, St. Mildred's Court, Poultry, E.C., solicitor; A. D. Fairbairn, 67, Watling Street, E.C., chartered accountant; L. F. O'Brien, 7, St. Mildred's Court, Poultry, E.C., solicitor. Minimum cash subscription, seven shares; the number of directors is not to be less than three or more than nine; the first are G. H. Brown, J. Heal, E. W. Elliott, H. C. Hall, A. Hair and A. D. Fairbairn; qualification (except first directors), £200; remuneration (except managing director), £100 each per annum, (chairman, £200). Registered office, Jewin House, Redcross Street, E.C.

Woodhouse Steel Casing Co., Ltd. (116,097).—This company was registered on May 29th, with a capital of £6,000 in 4,000 6 per cent. participating non-cumulative "A" preference shares of £1 each, and 4,000 "A" ordinary shares of 10s. each, to take over the business of the "Woodhouse Steel Casing Co.," a limited partnership consisting of A. E. Woodhouse (general partner) and E. Jones (limited partner), and to carry on the business of manufacturers and sellers of electrical appliances, engineers, founders, metal rollers, &c. The subscribers (with one share each) are:—A. E. Woodhouse, Craven House, Kingsway, W.C., engineer; W. W. Little, 46, Richmond Gardens, Shepherd's Bush, W., engineer. Private company. The number of directors is not to be less than two or more than five; the first are A. E. Woodhouse and W. W. Little, both permanent; special qualification of W. W. Little, 500 "A" preference shares. Registered office, Craven House, Kingsway, W.C.

Samuel Hartford & Co., Ltd. (116,148).—This company was registered on May 31st, with a capital of £10,000 in £1 shares, to carry on the business of manufacturers of and dealers in wires, cables and lines of all kinds, electricians, electrical engineers and contractors, &c., and to adopt agreements with S. Hartford and P. Woolright. The subscribers (with one share each) are:—S. Hartford, 67, Lord Street, Liverpool, electrical engineer; P. Woolright, 15, Hargreaves Road, Sefton Park, Liverpool, electrical engineer. Private company. The number of directors is not to be less than two or more than five; the first are S. Hartford and P. Woolright (both permanent); qualification, 200 ordinary shares. Registered by T. T. Hull and Sons, 22, Chancery Lane, W.C.

Mansell, Ltd. (115,871).—This company was registered on May 17th, with a capital of £500 in £1 shares (450 7 per cent. cumulative preference and participating and 50 founders'), to take over the bnsiness of electricians, electrical and mechanical engineers and contractors, cinematograph manufacturers, &c. The subscribers (with one share each) are:—M. Mansell, 25, Gresham Road, Stockwell, S.W., electrical engineer; Miss E. Booker, 1, Clevedon Mansions, East Twickenham. Private company. Table "A" mainly applies. Registered office, 13, Cecil Court, Charing Cross, W.C.

Kjellberg Syndicate, Ltd. (116,140).—This company was registered on May 31st, with a capital of £130 in £1 shares, to work and turn to account in the United Kingdom and Colonies an invention for improvements in electric welding or soldering and for electric switches, and to adopt an agreement with the Elektriska Svetsnings Aktiebolaget. The subscribers (with 20 shares each) are:—G. I. H. Davidson, 5, London Wall Buildings, E.C., merchant; R. S. Prinsep, 44, Belgrave Road, S.W., engineer. Private company. The number of directors is not to be less than two or more than seven; the first are G. I. H. Davidson, R. S. Prinsep, G. H. Hannay, E. G. Thormadlen, T. M. Aitken and J. B. Hamilton; qualification, £2. Registered by H. W. D. Wright, 22, Surrey Street, Strand, W.C.

CITY NOTES.

Brush Electrical Engineering Co., Ltd.

MR. E. GARCKE (chairman) presided at No. 1, Kingsway, W.C., on Wednesday, over the annual general meeting of the above company.

In moving the adoption of the report (see ELECTRICAL REVIEW, page 886), the CHAIRMAN said the results of their business for the past year were better than for the preceding year, but they were not good enough. However, they hoped during the current year to show a further improvement. He would not deal with all the items in the balance-sheet or profit and loss account, but, in order to make the position clear, he would summarise and endeavour to simplify the statement by a few figures. The gross profit for the year was £28,159, as compared with £14,349, or practically double. The net profit before paying debenture interest was £6,889, as compared with a loss of £3,705. After paying debenture interest, there was a loss of £10,780, as compared with a loss in the preceding year of £21,230; so there had been a distinct improvement, but, he was sorry to say, not sufficient to enable them to meet their charges in full. In the balance-sheet their debit balance on profit and loss account, together with the discounts on the prior lien stock issue, showed together an increase of £6,456, and their expenditure on properties, stock and work in hand, taken together showed an increase of £10,220. Therefore on that side of the balance-sheet they had an increase of £16,676. How had that money been provided? It was found as to £11,500 by a slight diminution in their cash, a diminution in their investments, and the amount owing to them was larger. Taking all these items together, they were £11,500 less than last year. On the other hand, their debenture obligations and the amount owing to creditors taken together were £5,120 more. Putting the £11,500 and the £5,100 together, they made £16,000 by which their profit had increased. Although the result for 1910 was better than in the two preceding years, it was still disappointing, as it showed they did not earn the interest on their debenture stock in full. The causes might he said to be (1) an insufficient volume of business, and (2) the keen competition for such orders as were placed resulted in unremunerative prices. There was probably no profession, business, or trade, in which the expenses were relatively so heavy, the responsibility so great, and the reward so insignificant, as in the electrical engineering industry. The conditions were constantly changing. New inventions and applications succeeded each other with disconcerting rapidity, and made it almost impossible, speaking generally, to standardise or settle down to economic production in large quantities. These conditions necessitated the retention of experts who were specially skilled in their various departments, and the establishment expenses of the business were, therefore, always high, and could not, without crippling the organisation, be reduced below a certain minimum, whether trade be good or bad. To these considerations they must add the fact that some of their competitors, in the anticipation of the demand for electrical production on a scale which had not yet manifested itself, laid down works of a capacity far in excess of the real requirements, and in their efforts to feed these works, they were often driven to accept for their products, prices and terms which could not prove remunerative. It must also be remembered that in this market of free imports they had to meet the competition of the most powerful Continental manufacturers, who, with their home markets secured to them by impenetrable tariffs, were able not only to work at a good profit, but also to create large reserves and spend large sums on experimental and development work, and so to equip themselves to take advantage of the new inventions and discoveries with a promptitude which the English manufacturer under existing conditions could not hope to rival. If shareholders would have regard to these conditions and circumstances, they would be able to form some idea of the difficulties under which electrical manufacturers laboured in this country. He would like to refer very briefly to the effect of the new Invalidity and Unemployment Bill, and its effect upon their operating expenses. Admitting that the object of the Bill was in every way laudable, he would ask if the handicap which it put on struggling industry had been sufficiently considered; the argument for the unemployment section of the Bill was that the trades it legislated for were precarious. But if they were precarious for the workmen they were so for the employer too, and it was not clear what benefit the employers could hope to receive in return for the heavy contributions they would have to pay. A rough calculation showed that the contributions required from employers under this Bill were going to increase the expenses of the company by £2,000 per annum, which was a heavy charge on a business not meeting its fixed charges. The only consolation they had was that the accumulative effect of these successive burdens must be to hasten the coming change in the attitude of public opinion in respect of their home industries. He had a few crumbs of comfort to refer to. During the last few months there had been a decided revival of business in the electrical engineering industry. Many of the central power stations had now recovered the temporary loss of load they had to face, owing to the general adoption of the current-saving filament lamp, and they were finding it necessary to place additional orders for plant. Of these orders they had secured their share, and it was gratifying to find that their turbo-generators and their power house plant were held in such excellent repute. They were at present carrying out contracts involving the supply of turbo-generators for the Admiralty and for electrical power stations at Edinburgh, Walthamstow, Kettering, Folkestone, Ballarat, Bombay and Philadelphia, as well as for various collieries, cement works, spinning mills, and others. The enormous advantages of the exhaust and mixed pressure turbine for the utilisation of waste steam were now receiving a wide recognition, and the Brush Co. was well placed to share in the extension of business which was confidently looked for in that direction. They ended the year with a much larger volume of unexecuted orders in the factory than was the case in the previous year, and that circumstance, coupled with the fact that the new orders secured this year were above the average, justified the hope that they might this year turn the corner. He had to refer to the paragraph in the report in which it was stated that the amount now standing to the debit of the profit and loss account, and the fact that depreciation not yet provided for had taken place, pointed to the necessity of an early reorganisation of the company's share capital. As they would see, the debit balance was £61,000, and the discount on the debentures issued amounted to £15,900. Of course, they might let these debits stand, in the hope of gradually wiping them off out of the profits in future years, but this would take a long time, and in the meanwhile they could pay no dividends. As representing some large shareholders, he had no hesitation in saying they preferred to face the situation by writing off the capital which had been lost, so that they might have a prospect of receiving a dividend on the profits they earned. Taking all things into consideration, the directors were of opinion that it would be in the best interests of the company to formulate some scheme so as to put the balance-sheet on a proper basis. In conclusion, the chairman referred to the fact that Mr. Steinitz, one of the managing directors, had left the company to take up another appointment, and Mr. Broadhurst now became sole managing director. Mr. Broadhurst's knowledge of the business extended over 30 years and there was no man in the industry better acquainted with the conditions under which they had to operate.

MR. W. L. MADGEN seconded the motion.

MR. CATHCART pointed out that some years ago they wrote the capital down, and he hoped this time it would be written down sufficiently.

MR. MARCHMONT thought the whole position was very bad, and to use an Irishism, it seemed that if they wanted to pay dividends they would have to get rid of all the capital. He suggested that the board should have a committee of shareholders to confer with them.

GENERAL RAMSAY remarked that so long as the present Government and Free Trade existed, it was hopeless to try and get on, and it would be better to shut up the whole thing.

The CHAIRMAN said the cost of reconstruction would not be large. He hoped on this occasion they would deal adequately with the writing down, but they were cutting the thing very fine, and if they cut down too much they might have nothing left. However, whatever goodness was in the property would be preserved by the remainder of the capital. He did not accept the view that because they had lost a good deal of property they should close up. So long as there was life there was hope, and it was their bounden duty not to give up the case, however bad, so long as there was a chance of it being retrieved. He did not think a committee was necessary, but if any shareholder could assist the board in any way he would not only be welcome, but invited.

The report was then agreed to.

South America.—The *Review of the River Plate* says that at an extraordinary general meeting of shareholders of the Compagnia Franco-Argentina de Electricidad, it was resolved to increase the capital to 10 million dollars. "This company should have a good future before it, having a strong financial backing, and the financial group interested in it have recently obtained a controlling interest in the Anglo-Argentine Electric Light Co."

The directors of the Anglo-Argentine Electricity Co. have declared an interim dividend of 3 per cent. The offices of this company have been removed to Esmeralda 188.

British Electric Traction Co., Ltd.—Just as we go to press, the annual report of this company comes to hand. The directors report a general improvement in the position and prospects of the company. No increase of dividend is recommended, but £25,000 is to be placed to reserve, as against £15,000 in the previous year. It is considered that "the time has now arrived when the interests of the company will best be served by a reorganisation of the capital, dealing with the arrears of dividend on the preference shares, and equitably adjusting the relations between the two classes of shares." The proposals in this connection are to be placed before the shareholders at an early date. We shall publish the report in full next week.

Aluminium Corporation, Ltd.

THE report of the directors has been issued, together with the balance-sheet covering the transactions of the company from its incorporation on December 14th, 1909, to December 31st, 1910. The period covered by the accounts has been devoted in the main to the completion of the various works and the initial steps necessary to actual manufacturing operations. Aluminium is now being made on a commercial scale, the metal produced being of a high grade. The works are being gradually and carefully extended to their full capacity, and it is anticipated that the output will find a ready market. The dam at Eigiau Lake, Dolgarrog, is on the eve of completion ; the Cowlyd Leet has been put into operation, and the necessary water rights of the Dulyn River has been acquired. A steam barge has been purchased and a wharf erected on the river-side at the works, and the very serious problem of traffic in connection with the supply of raw materials for the Dolgarrog Works, and the dispatch of the manufactured metal, has thus been solved. The accounts show that the company's liability in connection with the shares of the Bauxite Refining Co. has been paid up in full, thus enabling the Bauxite Works to be completed to a capacity sufficient to supply the Corporation with alumina of first quality. In order to comply with certain conditions of the scheme of reconstruction, an extraordinary general meeting is being convened, and will be held immediately after the close of the annual meeting, for the purpose of passing the necessary formal resolution to enable the preference shares to be converted into preference stock and the ordinary shares to be sub-divided and converted into preference and ordinary stock.

National Gas Engine Co., Ltd.

THE directors announce that they have had under consideration for a considerable time the advisability of rearranging the capital of the company so as to make it more in accordance with the market value of the shares. Now that the whole of the capital is called up, a favourable opportunity occurs for effecting this change, and it is, therefore, proposed to register a new company with a capital of £1,000,000, divided into 400,000 5 per cent. cumulative preference shares of £1 each, and 600,000 ordinary shares of £1 each. Each preference shareholder in the old company will receive six 5 per cent. £1 cumulative preference shares in the new company for every five £1 preference shares at present held by him, and each ordinary shareholder in the old company three fully-paid £1 ordinary shares for each £1 share at present held. This is equivalent to 24s. per share for the preference shares, and 60s. per share for the ordinary shares in the capital of the new company. The directors believe that this change is fully warranted by the price at which the shares are at present changing hands, and by the profits made by the company in the past, together with its prospects in the future. An extraordinary meeting is to be held at Ashton-under-Lyne on June 15th to pass the necessary winding-up resolution for reconstruction purposes, and to appoint a liquidator. The management of the business will remain as heretofore. As the concern is being taken over from July 1st, 1911, a sum of money is being reserved out of the profits of the old company sufficient to pay the ordinary shareholders of the old company the usual interim dividend at the rate of 20 per cent., and to the preference shareholders at the rate of 5¼ per cent. ; the balance of profits remaining after payment of the said dividends will form part of the assets to be handed over to the new company.

United Electric Tramways of Monte Video, Ltd.

THE directors, in submitting the accounts of the company for the year to March 31st, 1911, state that the results of the operation of the tramway system for the year to October 31st, 1910, are as follows :—

	1909-10.	1908-9.	Inc. or dec.
Gross receipts	$1,315,955	$1,190,310	+ $125,645
Operating expenses	731,994	694,588	+ 37,406
Net receipts	$583,961	$495,722	+ $88,239
At exchange of $4.7 to the £..	£124,247	£105,472	+ £18,775
Passengers carried	32,474,355	29,293,804	+ 3,180,551
Car-miles run	6,185,737	6,282,240	— 96,503
Percentage of operating expenses to gross receipts ..	55·62	58 35	— 2 73

The extensions to the main car-shed and store shed, and the enlargement of the company's hotel at Pocitos have been nearly completed, but the result of these and other improvements is not fully reflected in the revenue results shown above, as the works were in progress during the year. The extension of the lines to the suburb of Maldonado (approximately 3 miles), in terms of the concession granted to the company, is now in course of construction, and is expected to be open for public service during the next few months. The directors regret that during the past month there has been a general strike in Monte Video, including the tramway employés. Owing to the absence of adequate protection for the men who were willing to work, the services were entirely suspended for several days. The terms upon which the strike has been ended will involve a permanent additional charge upon the future revenues. The amount received from La Sociedad Comercial de Monte Video in respect of dividend and interest was £121,329. The profit and loss account for the year, after providing for administration expenses and charging £40,580 for debenture interest, shows a credit balance of £76,254. To this must be added the balance of £11,848 brought forward from last year, making a total to be dealt with of £88,102. There has been set aside for the purpose of the debenture stock redemption fund £2,555, and transferred to renewals and contingency account £20,000 ; interim dividends were paid on December 15th, 1910, in respect of the half-year to September 30th, 1910, on the preference shares, at the rate of 6 per cent. per annum, less income-tax at 1s. 2d. in the £ (£12,712), and on the ordinary shares at the rate of 6 per cent. per annum, less income-tax at 1s. 2d. in the £ (£11,300). The directors now recommend the payment of the following dividends for the half-year to March 31st, 1911 :—On the preference shares, at the rate of 6 per cent. per annum, less income-tax at 1s. 2d. in the £ (£12,712) ; on the ordinary shares, at the rate of 8 per cent. per annum, less income-tax at 1s. 2d. in the £ (making 7 per cent. for the year) £15,067, leaving to be carried forward £13,755.

Ericsson Telephone Companies in France and Austria.—It is stated that a new Ericsson Telephone Company has been formed in Paris, under the name of "Société des Téléphones, L. M. Ericsson," for the manufacture of telephonic apparatus and telephone material in France. The capital of the company is to be at first 5,000,000 fr., divided into shares of 500 fr. The shares will be issued by the French banks, the Banque de l'Union Parisienne, the Compagnie Commerciale, the Swedish Ericsson Society and the firm of L. M. Ericsson. The works of the new company will be erected outside Paris, and will be independent of all existing French companies. Mr. L. M. Ericsson also contemplates establishing extensive telephone works in Austria, where Swedish telephones have become exceedingly popular. According to the *Neue Freie Presse*, in Austria it is reported that there will soon be a great and rapid development of telephonic activity, for it is expected that the Government will soon issue a special telephonic loan of 60 million Austrian crowns, with the object of improving the telephonic service throughout the country. In Russia, Mexico, and many other countries in Europe and America, the use of Ericsson telephones is rapidly increasing.

Victoria Falls and Transvaal Power Co., Ltd.—The directors' report (says the *Financier*) states that the year's business to December 31st resulted in a profit of £157,749, which, with the balance of revenue and expenditure, as shown in the balance-sheet of 1909, amounting to £135,397, makes a gross total of £293,147. After providing for interest on debentures and income-tax thereon for 1910, amounting to £82,550, and depreciation for the years 1907, 1908 and 1909, amounting to £75,886, and for the year 1910, to £38,963, the balance of £95,747 is carried to the balance-sheet. Out of the foregoing balance the directors declare a dividend at the rate of 6 per cent. per annum on the amounts for the time being paid up on the preference shares, from January 1st, 1909, to October 14th, 1909. Under Clause 6 of the memorandum of association, the preference shares are entitled to 6 per cent. per annum on the capital for the time being paid up thereon from October 17th, 1908. Only 5 per cent. per annum having been paid to December 31st, 1908, on the preference shares paid up at that time, the balance of 1 per cent. per annum will be paid on these shares for this period. These payments will absorb approximately £58,347, leaving £37,400 to be carried forward.

Prospectus.— *Ransomes Sims & Jefferies, Ltd.*— This company is offering for subscription 133,334 preference (5½ per cent.) shares of £1 each at par, and £166,667 debenture stock (4½ per cent.) at 99½.

Cape Town Consolidated Tramways and Land Co., Ltd.—The directors' report for 1910 shows a balance of £1,046 to the debit of profit and loss account, which, added to the balance brought forward, makes the total to the debit of profit and loss £3,215. Neither of the estate companies nor the Camps Bay Tramway Co. has been able to declare any dividends during the past year. The result of the operations of the Camps Bay Tramways shows (says the *Times*) a loss on working of £376, which compares with a loss for 1909 of £1,560. Since October, however, the tramways have shown a profit on operation each month.

Stock Exchange Notices.—Applications have been made to the Committee to appoint a special settling day in and to grant a quotation to—

Christchurch Tramway Board—£61,400 4½ per cent. debentures, 1934, of £100 each, Nos. 2,297 to 2,850.

And to allow the following securities to be quoted in the Official List :—

Shawinigan Water and Power Co.—Further issue of £205,480 4½ per cent. perpetual consolidated mortgage debenture stock.

The Stock Exchange Committee have appointed a special settling day as under :—

Wednesday, June 21st.—Sao Paulo Tramway, Light and Power Co., Ltd.—Fully-paid scrip for £300,000 5 per cent. perpetual consolidated debenture stock.

And ordered the undermentioned to be quoted in the Official List :—

Bell's United Asbestos Co., Ltd.—Further issue of 19,373 shares of £1 each, fully paid (Nos. 120,001 to 139,373).

La Plata Electric Tramways Co., Ltd.—250,000 ordinary shares of £1 each, fully paid (Nos. 1 to 250,000).

Sao Paulo Tramway, Light and Power Co.—The directors have declared a quarterly dividend at the rate of 10 per cent. per annum.

Urban Electric Supply Co., Ltd.

The annual general meeting of the above company was held on the 31st ult. at Salisbury House, London Wall, Mr. P. D. Tuckett presiding.

The Chairman, in moving the adoption of the report, said that the shareholders had met on that occasion with a statement of accounts which the directors considered satisfactory, although the increased profit for the past year was not as large as that for the previous year, when certain conditions favoured them, as he explained to the shareholders a year ago. In a year, however, in which few electric supply undertakings showed any marked increase in profits, whilst many of them showed an actual decrease, he thought there was no occasion to be dissatisfied with the increase of £2,404 which they had succeeded in realising. The profits earned at the various works amounted to £47,253, an increase of 5 per cent. on last year's figure of £44,849, against which the item, "rent of offices, secretarial and clerical work," was increased by £210 in accordance with the policy which they had pursued for the past four years, and which he had previously explained to them. The other items remained practically the same, leaving a balance of £44,912 to be carried down to the net profit and loss account. In the latter account the interest on deposit was a trifle more; debenture interest was £156 less, owing to the operation of the sinking fund, whilst the provision for depreciation was £250 larger at £2,221, leaving a balance of £1,528 to be made good by the contractors under their guarantee, as against £3,622 a year ago. The guarantee period thus ended with a shortage of a little over £1,500 in the amount required to pay a full 5 per cent. dividend on both classes of shares, and that before making adequate provision for depreciation, or charging interest on the very considerable debt due to the contractors. This result was naturally very disappointing to those of the shareholders, who, ten years ago, embarked their money in the undertaking on the strength of such very different expectations. Last year, instead of the estimated output of 5,800,000 units at 5½d. per unit, they sold less than half that number for private lighting, at an average price of 4½d. per unit, whilst the 6,100,000 units which they sold for power and other purposes only realised an average of 1·07d. per unit. Under existing conditions these prices were not unsatisfactory, but they represented a very different margin of profit to that on which the original estimate of profit was calculated. Then their two tramway undertakings at Glossop and Redruth had proved very much less profitable than was anticipated. The company were peculiarly unfortunate in embarking in the business at a time when an exaggerated estimate was very generally entertained of the profitable possibilities of both electric lighting and electric tramways. In the case of the tramways, their experience had been the same as that of other undertakings serving similar districts, whilst the lighting business was entered upon just at the time when the conditions were about to be wholly changed by the substitution of the incandescent gas mantle for the old flat flame burner. The company had, consequently, no opportunity of establishing the business on a profitable basis before it was overtaken by these altered conditions, which, in the case of small towns like theirs, made themselves felt in an aggravated degree. The heavy initial outlay had been incurred, but the business required to produce an adequate return thereon could no longer be secured in sufficient quantity and at sufficiently remunerative rates. Reviewing the situation in the light of after events, it was evident that they would have been better off without the tramways, and in some cases their capital expenditure appeared unduly high, although with small towns like theirs the cost must necessarily be high. Apart, however, from the inadequacy of the return on capital resulting from these features, there was nothing in the present position to indicate that the business was being conducted otherwise than with efficiency, economy and judgment. All the returns compared favourably with those of similar undertakings in the matter of connections, output, price, cost, &c. The one feature in which they did not compare favourably was in the return on capital—this was undoubtedly where the trouble lay. In the expectation of more profitable business than had been forthcoming, money was spent too freely in the early days, but the return had been steadily rising, and as the business was built up and additional capital made itself felt, and with a continuance of the infinite care which he could promise them was being devoted to the conduct of the business, they had every reason to feel confident that the return would continue to improve. Returning to the accounts, there were one or two items in the balance-sheet to which he might properly call their attention. Capital expenditure showed the large increase of £71,000, of which part was due to normal development at a somewhat more rapid rate than in the previous two years, as they would see from the table of lamp connections; part was due to the fact that during the past two or three years they had unduly restricted plant and main extensions, until they were satisfied that the influence of the metal lamp was not going to result in a reduction of their output; but more than half the increase was accounted for by the development of their Cornish undertaking, to which he referred a year ago. The greater part of the expenditure on this undertaking was, however, incurred towards the end of last year. It accordingly brought in no return last year, nor would it bring in a full return this year, but next year it would swell their profits. The next item of £400 investment in the Penzance and District Electric Supply Co. was a new one, and required a few words of explanation. It represented the cost of the acquisition of the provisional orders covering that town and district, and they acquired it because it enabled them to tap a useful additional load at a comparatively small cost by an overhead main already carried within a few miles of the town. It was in no sense a departure from their policy of restricting themselves to the development of their existing undertakings, and had it involved a separate station or other heavy capital outlay they should not have entertained it. On the liabilities side they would notice that the directors had redeemed a further £3,540 debenture stock, the profit of £679 resulting from its redemption at a discount, having been applied to reducing the amount of the item on the other side, discount and stamp duty on debenture stock issued. The amount owing to the contractors was increased by £57,264, and they would bear in mind that this debt was now bearing interest. The last item, which was a new one, amount received from consumers *re* mains, £982, arose in this way. They must know that the Electric Lighting Act, 1882, provided that they should lay 60 ft. of service cable free on the public road, any length in excess of this, as well as any length laid on private property, being chargeable to the consumer. Until the last few years the right to demand payment was very seldom enforced unless the excess length was very considerable. Whilst electric lighting was establishing itself in the public favour, it was found impossible or impolitic to put any unnecessary obstacle in the way of securing a consumer, and unfortunately in its early days electric lighting was erroneously regarded as being sufficiently profitable to carry incidental expenditure of this kind. Lately, however, they had become more exacting in requiring consumers to bear the proportion of the cost for which they were liable, and hence this item of £982 representing their contribution for the past two or three years, hitherto held up in the branch accounts. With regard to their various undertakings, Hawick and Twickenham had done remarkably well, and it was, therefore, all the more disappointing that Godalming, Camborne and Redruth, and Glossop should have gone back to the extent of over £1,000 between them, thereby reducing their increase of profit instead of contributing thereto. A year ago he warned them that they were likely to see a decrease in the case of Camborne and Redruth. In the case of Glossop the decrease was more than accounted for by the falling off in the profits from the tramway, owing partly to heavier repairs, and partly to decreased receipts, the latter resulting from the acute and continued depression in the cotton trade during practically the whole of last year. Godalming's decrease followed substantial increases in the previous two years, and was due partly to heavy repairs and partly to the loss of a large power-user. Apart from the tramway repairs, which at both Glossop and Redruth were likely to be exceptionally heavy this year, all three undertakings were now doing better, and would, he hoped, this year make up for their shortcomings last year. Indeed, for the first quarter of this year he was happy to say they had made a most promising all-round start as compared with the corresponding period of last year. They had connected 10,814 33-watt lamp equivalents, as compared with 9,633, an increase of 12 per cent., of which 49 per cent. represented lighting consumers, as compared with 39 per cent. for the corresponding period. They had sold an additional 482,205 units, an increase of 22 per cent., and they had substantially increased their profits. So far as output and profits were concerned, these results were, no doubt, partly due to the fact that the comparison was with a March quarter last year, which was distinctly disappointing. They could not, therefore, be taken as a criterion of the rate of progress which they could rely on maintaining. Nevertheless they were, on that account, none the less satisfactory and encouraging, and they certainly looked forward hopefully, and he thought he might say confidently, to a successful year. Last year they sold in all 1,186,047 more units, or nearly 16 per cent. more than in the previous year, the power and heating units representing an increase of 27 per cent. as against an increase of 5 per cent. in the lighting units. During the year they connected the equivalent of an additional 48,564 33-watt lamps, a 10 per cent. increase on the previous year, and this compared with a 9 per cent. increase a year ago and an 8 per cent. increase for 1908, showing that they were more than maintaining their rate of increase, and this was all the more encouraging since, for the previous four or five years, there was a steady decline in the rate of increase. It was also gratifying to secure this increase in spite of the fact that, with metal-filament lamps, they required to connect three times the candle-power they formerly did to give them an equivalent connection in watts. Insofar as the new connection represented lighting as distinguished from power, it was a clear indication that the metal lamp was stimulating new connections, whilst he thought they might now consider that they had felt the worst of its adverse influence on old connections, although they had by no means ceased to feel it, and it was likely to be some years yet before they did. The shareholders were aware that their contract with Edmundson's, under which their dividends had hitherto been guaranteed, expired on December 31st last. In view of that fact, they had decided not to pay any interim dividend this year, but to defer any declaration of dividend until the accounts for the year were available. Since the close of the year a new contract for seven years had been entered into with Edmundson's providing for the future general management, and in part for the future financial requirements, of the company, as explained at the extraordinary general meeting held last January when the scheme was approved. By this new agreement their position was very greatly strengthened and secured, and he had no doubt that if only they would cultivate the virtue of patience for a time, they would in due course see the company in a much more satisfactory position from the point of view of distributable profits than it was to-day, but it was necessarily a matter of time, for the very stability of the business militated against a rapid increase of profits such as was often possible in the case of a more speculative one. The characteristics of their business were stability and steady progress. Subject to the competition of gas they were for all

practical purposes a protected industry, and when once the revenue had been established there were few safer or better investments. The difficulty was to increase the profits as rapidly as they would like, but if the unceasing efforts of everyone connected with the company could bring about more rapid progress, then more rapid progress was assured, for their energies were continuously directed to that end.

Mr. Francis E. Gripper seconded the motion and the report was adopted.

Birmingham and Midland Tramways, Ltd.

The meeting of this company was held on the 31st ult. at Electrical Federation Offices, Kingsway, Mr. C. S. B. Hilton presiding.

The Chairman, in proposing the adoption of the report (see Electrical Review, page 887), said he was glad to say that they were able to record distinct progress and to recommend the payment of a slightly increased dividend. While the year had been one of continued trade depression in the district served by the tramways, he hoped they had now turned the corner, and he believed they might look forward to the future with a certain amount of confidence. Debentures to the amount of £5,230 had been redeemed and cancelled during the year, and the discount on the purchase of the stocks had been, as in previous years, deducted from the discounts in respect of the issues. The loan from the Shropshire Power Co. remained at practically the same figure, and they had decided to write down their investment in the Motor Omnibus Co., by writing an amount off general reserve. Turning to the revenue, the traction section during the past four years had, in spite of all drawbacks, shown steady, if somewhat slow growth, while the lighting section had more than justified the hopes he expressed last year, and showed largely increased gross receipts and a satisfactory ratio of expenses. During the last four years the traction receipts had grown from £44,751 in 1907 to £48,025 last year. The electric light receipts in the same period had grown from £8,303 to £26,737. The total was £53,054 in 1907 and £74,762 in 1910, while the expenses had decreased from 53·7 per cent. to 52·9 per cent. The working balance, however, did not quite show the same ratio of increase as the total receipts, as the improved results had been partly negatived by the heavier standing charges, and in particular by heavier payments for rent to the Corporation and a larger provision for renewals. The gross profits from working both sections of the business had grown since 1907 from £12,901 to £18,059. Therefore, from an operating point of view, the position generally showed good progress. That these improved results were not reflected in improved dividends to the extent they would like, was chiefly due to the lower returns on their investments in other companies. This, with improving trade, they hoped would be gradually remedied, and that in future their investments would show better results. It was impossible to state what the position of the tramways would be when the Greater Birmingham Bill had gone through; but, in any event, the company had every reason to be satisfied with its investment in that company. Their relations with the local authorities generally remained friendly, and the local staff and their managing director were making every effort to maintain those relations upon which so much of their future prosperity must depend. It was with much regret that he had to announce the retirement of their manager, Mr. Cramp, who had been with the company for over 16 years, during which period he had rendered valuable and ungrudging service. They had been fortunate in obtaining the services of Mr. Bond to succeed Mr. Cramp as general manager. That gentleman had a knowledge of the business and an interest in it, and he was in every way qualified to succeed Mr. Cramp.

Mr. W. L. Madgen seconded the motion, and the report was adopted.

Kalgoorlie Electric Power and Lighting Co., Ltd.

Mr. Roger Wallace, K.C., presided on May 31st at Winchester House, E.C., over the fifth ordinary general meeting of the above company.

In moving the adoption of the report, the Chairman said the working of the undertaking at Kalgoorlie had proceeded in a very excellent manner during the year, with the exception of one or two drawbacks. As they knew, there was a fire in the Boulder Perseverance Mine, who were one of their principal customers, and consequently they were unable to take a supply of electricity from them. In spite of that, however, they had increased their revenue for the year, and this, he thought, was largely due to the policy of the directors in putting down new plant and in maintaining the old plant in an efficient condition during the whole course of the company's life. They had just put down a new unit, which last year he mentioned would be required, and he had had a telegram during the last week from the manager, stating that it had had a satisfactory run. Now that the Perseverance Mine was at work again they were supplying a much larger load of current than they had done during the past. He did not wish to go into figures, but he could tell them that the profit for April of this year was double that of the corresponding month of last year. This would show them that in spite of all the disadvantages due to the strike and the fire, they were now going ahead. This was enough to indicate to them that the prospects for the current year were extremely good, and that they would be in a position to maintain their dividend on the preference shares. He also hoped that the result of the new unit they had put down could enable them to pay a dividend on the ordinary shares. It was impossible to say what was going to happen during the year. They might have another strike or another fire, but in view of the fact that they had further new contracts, and that the full product of their new plant was contracted for, they would see that the prospects of the company were very favourable. As they were addressing not only the shareholders but their consumers in Australia, he would like to point out to the other mine-owners who had not yet taken a supply from them the great advantage such a supply had been for the Perseverance Co. In the first place, when they had their fire they had not to bear any loss which might otherwise have fallen on them from the destruction of their electrical plant; and, secondly, they were able to devote their whole attention to the remainder of the plant and get it into working order again. They had, therefore, no trouble in getting their supply of electricity, and, consequently, they had a natural form of insurance by taking the supply from them which they would not have had if they used an isolated plant of their own. And when consumers came to them and made contracts and told them they charged a higher price than they could produce it at, they generally overlooked that factor, as they generally also overlooked all costs of management and every other possible cost. With regard to future extension and the policy of the directors, they would, in order to provide for increased loads in the future, have to make extensions, and, with the view to this in the past, they had had regard in the disposition of their plant to the making of further extensions at as small a cost as possible. They had their Stewart engines, which had excellent stand-bys for them, and the next extension would be putting down a turbine which would make these engines quite efficient. Of course, they only used these as spares; but eventually they would be as economical as any plant they had put down, and the cost of conversion would be comparatively light. The only other point he would mention was with regard to the contract with the Kalgoorlie tramways. They would remember he went to Australia some five years ago in connection with the tramways. It was provided in the preliminary contract that they were to work them. When he got out there he found that the officials who were connected with the old company were rather indisposed to leave, and for the sake of satisfactory working they made a fresh arrangement, always provided that if that arrangement broke down the first arrangement survived. As the five years had elapsed, and the old contract under which they took their electricity at a certain price which was remunerative to them having terminated, it became a question whether they went on with the second contract and worked the tramways. He had several meetings, and looked into the position of the tramways company and they had very amicable discussions with those who were managing it, with the result that they were going on for another five years on the same basis as the previous five years, that was to say, there would be no reduction in price, and all other conditions of the contract remained the same. Therefore they would see that, the output of the company being fully taken up, they were working at less proportional cost than they did before and the profits were increasing in the ratio he mentioned.

Mr. G. P. Doolette seconded the motion, and it was carried.

Diesel Engine Co., Ltd.

The directors' report for the financial year ended March 31st, 1911, states that the gross profit amounts to £12,376, as compared with £11,564 for the previous year. There have been exceptional expenses during the past year in connection with developments. These, together with the usual cost of working, have reduced the net profit to £2,147 for the year. The total at credit of profit and loss account now stands at £5,240. Out of this the directors recommend the payment of a dividend of 5 per cent. on the preference shares, absorbing £938, and carrying forward £4,302. During the year the policy of the company, referred to at the last general meeting, of bringing the Diesel marine engine prominently before the shipping world, has been vigorously pursued. The result has already proved most satisfactory, inasmuch as several leading British shipbuilding firms are now manufacturing Diesel marine engines on the basis of a royalty to the company extending over a number of years. As, however, the expenses of further pioneering work in this direction are likely to be heavy, it has been deemed prudent to keep the balance standing at profit and loss account in hand, and therefore not to pay a dividend on the ordinary shares for the past year. The directors have invited Mr. Stephen Furness, M.P., of Messrs. Furness, Withy & Co., Ltd., to join the board, it being felt that this gentleman's business experience, as well as his wide connection with shipping and shipbuilding, will be of considerable assistance to the company. At the meeting shareholders will be asked to formally elect Mr. Furness a director.

Peel-Conner Telephone Works, Ltd.

The directors report in submitting a balance-sheet showing the position of the company's affairs at March 31st, 1911, that the profit and loss account shows a net profit from the commencement of the company, after writing off the preliminary expenses amounting to £527 and placing £2,151 to reserve, of £7,277. This balance will enable the directors to pay the full dividend at the rate of 5 per cent. upon the preference shares from the date of issue, amounting to £6,956, and to carry forward to the next account, £320. The directors are gratified with the result of the first year's trading. The difficulties of training efficient labour are gradually being overcome. The work executed is of the highest standard, and has met with the full approval of purchasers. The factories are at present efficiently equipped with machinery and staff, and a number of contracts recently obtained ensure their full employment for some considerable time. The retiring director is Mr. Ernest G. Byng, who offers himself for re-election.

MARKET QUOTATIONS.

Wednesday, June 7th.

CHEMICALS, &c.		Latest Price.	Fortnight's Inc. or Dec.
a Acid, Hydrochloric	per cwt.	5/-	..
a „ Nitric	„	23/-	..
a „ Oxalic	„	23/-	..
a „ Sulphuric	„	5/6	..
a Ammoniac, Sal	„	42/-	..
a Ammonia, Muriate (crystal) ..	per ton	£20	..
a „ „	„	£30	..
a Bleaching powder	„	£5 10	..
a Bisulphide of Carbon	„	£18	..
a Borax	„	£16	..
a Ferro-Silicon (50 %)	„	£12 10	..
a Copper Sulphate	„	£23	£3 inc.
a Lead, Nitrate	„	£24	..
a „ White Sugar	„	£22 15	..
a „ Peroxide	„	£32	..
a Methylated Spirit	per gal.	2/6	..
a Potassium, Bichromate, n casks	per lb.	8½d.	..
a Potash, Caustic (75/80 %) ..	per ton	£20	..
a „ Chlorate	per lb.	8½d.	..
a „ Perchlorate	„	4½d.	..
a Potassium, Cyanide	„	7d.	..
a Shellac	per cwt.	75/-	..
a Sulphate of Magnesia	per ton	£4 10	..
a Sulphur, Sublimed Flowers ..	„	£6 10	..
a „ Recovered	„	£5 10	..
a „ Lump	„	£5 5	..
a Soda, Caustic (white 70 %) ..	„	£11	..
a „ Chlorate	per lb.	8½d.	..
a „ Crystals	per ton	£3 5	..
a Sodium Bichromate, casks ..	per lb.	8d.	..
a „ Cyanide (basis 100 %) ..	„	7d.	..
METALS, &c.			
b Aluminium Ingots, in ton lots ..	per ton	£70	..
b „ Wire, in ton lots ..	„	£102	..
b „ Sheet, in ton lots ..	„	£120	..
p Babbitt's metal ingots	„	£38 to £145	..
c Brass (rolled metal 2" to 12" basis	per lb.	6⅝d.	⅛d. inc.
c „ Tube (brazed)	„	8¼d.	⅛d. inc.
c „ „ (solid drawn) ..	„	7d.	⅛d. inc.
c „ Wire, basis	„	6⅝d.	⅛d. inc.
c Copper Tubes (brazed)	„	9d.	⅛d. inc.
c „ „ (solid drawn ..	„	8⅜d.	⅛d. inc.
g „ Bars (best selected) ..	per ton	£70	£1 inc.
g „ Sheet	„	£70	£1 inc.
g „ Rod	„	£70	£1 inc.
e „ (Electrolytic) Bars ..	„	£57 10	15/- inc.
e „ „ Sheets ..	„	£73 5	15/- inc.
e „ „ Rod ..	„	£61	£1 inc.
e „ „ H.C. Wire	per lb.	7⅞d.	⅛d. inc.
f Ebonite Rod	„	5 3	..
f „ Sheet	„	4 9	..
g German Silver Wire	„	1/11	..
h Gutta-percha, fine	„	8/6	..
h India-rubber, Para fine	„	4/4	1½d. dec.
i Iron Pig (Cleveland warrants) ..	per ton	46/3	7½d. dec.
i „ Wire, galv. No. 8, P.O. qual.	„	£14	..
g Lead, English Ingots	„	£13 5 to £13 10	2/6 inc.
m Manganin Wire No. 28	per lb.	6/6	..
g Mercury	per bot.	£85	..
d Mica (in original cases) small ..	per lb.	6d. to 2s.	..
d „ „ „ medium	„	2/6 to 4/-	..
d „ „ „ large ..	„	4/6 to 8/6	..
p Phosphor Bronze, plain castings	„	11d.	..
p „ „ rolled bars & rods	„	1/0½	..
p „ „ rolled strip & sheet	„	1/1	..
o Platinum	per oz.	166/6	..
e Silicium Bronze Wire	per lb.	6⅝d.	⅛d. inc.
r Steel Magnet, in bars	per ton	£55	..
g Tin, Block (English)	„	£203 to £205	..
n „ Wire, Nos. 1 to 16	per lb.	2/4	1d. inc.
p White Anti-friction Metals ..	per ton	£45 to £150	..
k Zinc, Sh't (Vieille Montagne bnd.)	„	£29 10	..

Quotations supplied by—

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d F. Wiggins & Sons.
e Frederick Smith & Co.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakspeare.
h Edward Till & Co.
i Bolling & Lowe.
k Morris Ashby, Ltd.
l Richard Johnson & Nephew, Ltd.
m W. T. Glover & Co., Ltd.
n P. Ormiston & Sons.
o Johnson, Matthey & Co., Ltd.
p
r W. F. Dennis & Co.

Kent Electric Power Co.—We are informed that, at the annual general meeting of the Kent Electric Power Co., the chairman (Mr. J. F. Albright), in congratulating the shareholders upon the satisfactory increase in profit during 1910, stated that the position of the company had so greatly improved that it was evident that shareholders might anticipate that it would soon be in a position to pay a dividend on its priority shares, and that thereafter it might not be a great step to the payment of a dividend on the preferred ordinary shares.

Pulford Bros., Ltd.—We are informed that the thirteenth annual meeting of this company was held at the office of Mr. Theo. S. Sheard, chartered accountant, Liverpool, on Tuesday last. Mr. Egerton G. Pulford, who presided, reported that the business during the past year had greatly increased. Resolutions declaring a dividend of 25 per cent., free of income-tax, for the year ended March 31st last, and carrying the balance of profit to reserve fund, were passed. Mr. Theo. S. Sheard was re-elected auditor.

STOCKS AND SHARES.

Tuesday Evening,

The Stock Exchange returned to business after its Whitsun recess to find a good many orders waiting which had accumulated over the long week-end, and which gave the markets an appearance of activity for the first hour or so. The condition of the markets as a whole is healthier than it has been lately. There is still talk of trouble, and prices have hardened in many departments where recently they were distinctly weak. More confidence seems to be returning, but, at the same time, there will, of course, be a gradual falling away of business as the Coronation approaches, after which will come the first part of the summer holidays and the preparations for the usual dog-day conditions, which last, as a rule, up to September.

The Home Railway market has been rather flouted and ignored. It had its rise some few weeks ago, and the remains of the bull account are still troublesome. The brilliant weather, however, has stimulated buying, and in this movement the Underground stocks have not been entirely overlooked. Metropolitans and Districts, after being flat, rallied a trifle, so that the net result is slight. Central Londons have failed to recover from the bad falls which occurred last week, and City and South London has further declined.

Excitement in connection with National Telephone stocks continues to run fairly high. The company has already secured a notable success in the first clash of arms with the Government. The Railway and Canal Commissioners have decided that the Government must take over various properties which at first they declined to do, and in consequence of this, National Telephone Deferred shot up to 132, from which it has since reverted to 128, pressure to sell having caused the price to show a loss on balance. This preliminary encounter, naturally, must not be taken to mean too much, for there are many other points to be decided which are equally, if not more, important, and nobody can possibly tell at present which way they will go.

Eastern Telegraph Ordinary lost its rise of last week, and a little more in addition, but "China" shares keep firm. Speculation in Anglo-American stocks derived no fresh impetus from the oft-reiterated statement that all differences are now settled between this company and the Western Union. West India and Panama shares are *ex* dividend, and, allowing for this, the changes are insignificant. Globe Telegraph and Trust advanced again upon the increase in the dividend to 6 per cent. on the Ordinary shares, while the other trust companies' issues kept steady. Marconi shares, by touching 36s., exactly doubled the price from which the rise started. Dublin has been a prominent buyer of the shares, and ill-natured people in London want to know if the rise in the price is to form a prelude to another issue of shares.

In the Tramway group, Sao Paulo have again gone ahead very substantially. As we suggested a week or two ago, the advance appears to be based on the anticipation of a material increase in the dividend, and the high price of the shares makes the market a very restricted one, so that a comparatively small demand is enough to move the quotation to the extent of a point or two at a time. The Latin-Canadian group as a whole is pretty firm; rumours of fighting at Puebla did not worry the Mexican market, and there has been a steady investment demand for the prior charge issues. Mexican Trams having risen 1½, are down on balance, and the bonds are a trifle easier. Montreal Light, Heat and Power shares have advanced 8 points. Rio Trams put on 2¾.

There has not been much doing in the shares of the Home Electricity Supply group. Weakness in Metropolitans is again noticeable, from which it is inferred that there must be a block of shares overhanging the market, and a recovery can hardly be expected until this is disposed of. The market has derived no advertisement from the feverish excitement prevailing throughout the City in the matter of preparations for the Coronation festivities. All the principal buildings are being decked out with electric light devices in advance of the great event. Incidentally, it may be remarked that the Stock Exchange, amongst others, is going to have a grand illumination, but it must be added, furthermore, that the "House" has its own electric light installation. One or two of the provincial shares are a shade better. The new issue of Adelaide Electric shares was a great success, and applicants received only about 70 per cent. of their requests.

Aron Ordinary has been a good market, and are decidedly better. The Preference has also hardened. Edison & Swan "A" are better, and manufacturing shares keep very firm as a whole.

Northern Counties Electricity Supply Co., Ltd.—The directors state that the accounts for the year to December 31st show, after debiting interest and bad debts, a loss of £2,777, making a total debit balance of £5,756 to be carried forward.—*Financier.*

Tubes, Ltd.—The net profit for the year amounts to £6,584, plus £7,542 brought forward, making £14,127. The directors propose to pay a dividend of 1s. per share (less tax) and to carry forward £9,418.

SHARE LIST OF ELECTRICAL COMPANIES.

ENGLISH ELECTRICITY SUPPLY AND POWER COMPANIES.

NAME.	Stock or Share.	Dividends for 1909.	Dividends for 1910.	Closing Quotations June 6th.	Rise + or Fall —	Present Yield p.c. £ s. d.
Bournemouth & Poole, Ord. ..	10	5⅛	5⅛	8 — 9	..	6 2 3
Do. 4½ % Pref.	10	4½	4½	9 — 10	..	4 10 0
Do. Second 6 % Pref. ..	10	6	6	10⅝ — 10⅞	..	5 12 11
Do. 4½ % Deb. Stock	Stock	4½	4½	102 —104	..	4 6 7
Brompton & Kensington, Ord...	5	10	10	7⅞ — 8¼	..	6 1 3
Do. 7 % Cum. Pref.	5	7	7	7⅞ — 8	..	4 7 6
Central Electric Supply, 4 % Guar. Deb.	100	4	4	98 —101 xd	..	3 19 3
Charing Cross, West End & City	5	5	5	3⅞ — 4⅛	..	5 14 3
Do. 4½ % Cum. Pref.	5	4½	4½	4¼ — 4⅜	..	4 14 9
Do. "City Undertaking" 4½ % Cum. Pref.	5	4½	4½	3⅞ — 4⅛	..	5 2 10
Do. Do. 4 % Deb... ..	100	4	4	96 — 98	..	4 1 8
Chelsea, Ord.	5	4¼	5	4 — 4½	..	5 11 1
Do. 4½ % Deb.	Stock	4½	4½	100 —102	..	4 8 3
City of London, Ord.	10	7	7	11⅜ — 12¼	..	5 14 3
Do. 6 % Cum. Pref.	10	6	6	12 — 13	..	4 12 4
Do. 5 % Deb.	Stock	5	5	120 —124	..	4 0 8
Do. 4½ % Second Deb. ..	100	4½	4½	101 —104	..	4 6 7
County of Durham, 5 % First Mort. Deb.	Stock	5	5	92 — 94	..	5 6 5
County of London, Ord... ..	10	5	5	7⅞ — 8⅛	..	6 3 1
Do. 6 % Pref.	10	6	6	10¾ — 11⅛	..	5 7 5
Do. 4½ % Deb.	Stock	4½	4½	109 —111	..	4 1 10
Do. 4½ % Second Deb. ..	Stock	4½	4½	99 —102	..	4 8 3
Edmundson's, Ord.	5	Nil	Nil	11/16 — 13/16	..	Nil
Do. 6 % Cum. Pref.	5	Nil	Nil	2⅜ — 3⅝	..	Nil
Do. 4½ % First Mort. Deb. ..	100	4½	4½	86 — 89	..	5 1 2
Folkestone	5	5⅜	6	4⅜ — 4⅝	..	6 9 9
Do. 5 % Cum. Pref.	5	5	5	4½ — 5½	..	4 15 3
Do. 4½ % First Deb.	100	4½	4½	97 —100	..	4 10 0
Hove	5	8½	9½	6¾ — 7¼	..	6 11 0
Kensington & Knightsbridge, Ord	5	8	9	7 — 7⅞	..	6 2 0
Do. 4 % Deb.	Stock	4	4	93 — 95	..	4 4 3
Kent Elec. Power, 4½ % Deb. ..	Stock	4½	4½	80 — 84	..	5 7 2
London Electric, Ord.	3	2	2	1⅞ — 2⅛	..	2 16 5
Do. 6 % Pref.	5	6	6	4⅞ — 5⅛	..	5 17 1
Do. 4 % First Mort. Deb. ..	Stock	4	4	91 — 94	..	4 5 1
Metropolitan	5	5	5	3⅞ — 4	— ⅛	6 5 0
Do. 4½ % Cum. Pref.	5	4½	4½	4⅛ — 4¼	..	4 16 0
Do. 4½ % First Mort. Deb. ..	Stock	4½	4½	101 —104	..	4 6 7
Do. 3½ % Mort. Deb.	Stock	3½	3½	86 — 89	..	3 18 8
Midland Electric Corporation 4½ % First Mort. Deb.	100	4½	4½	98 —100	+1	4 10 0
Newcastle-on-Tyne	5	4	4	3⅞ — 4⅛	..	4 14 2
Do. 5 % Pref., Non. Cum. ..	5	5	5	4 — 4½	..	5 11 1
North Metropolitan Power Supply, 5 % Mortgages (Red.)	100	5	5	99 —102	+ 4	4 18 0
Notting Hill	10	7½	8	12 — 12⅝	..	6 5 6
Oxford	5	7	7½	6⅛ — 6⅝	+ ⅛	5 9 5
St. James' and Pall Mall, Ord.	5	10	10	8⅝ — 9¼	..	5 8 1
Do. 7 % Pref.	5	7	7	6⅝ — 7⅛	..	4 16 7
Do. 3½ % Deb.	100	3½	3½	86 — 88	..	3 19 7
Smithfield Markets, Ord. ..	5	Nil	Nil	1⅜ — 1⅝	..	Nil
South London, Ord.	4	5	5	3 — 3¼	..	6 3 1
Do. 5 % First Mort. Deb. ..	100	5	5	101 —104	..	4 16 2
South Metropolitan, 7 % Pref...	1	7	7	1⅛ — 1¼	..	5 12 0
Do. 4½ % First Deb. Stock ..	100	4½	4½	97 —100	..	4 10 0
Urban, Ord...	5	5	3⅝	⅞ — 1	..	18 15 0
Do. 5 % Cum. Pref.	5	5	3½	2⅝ — 3	..	6 5 5
Do. 4½ % First Mort. Deb. ..	100	4½	4½	87 — 89	+1	5 1 2
Westminster, Ord, ...	5	10	10	7⅜ — 8⅛	..	5 14 3
Do. 4½ % Cum. Pref.	5	4½	4½	5 — 5⅜	..	4 3 9

COLONIAL AND FOREIGN ELECTRICITY SUPPLY AND POWER.

Adelaide, 6 % Pref.	5	6	6	5½ — 5⅞	..	5 4 4
Calcutta, Ord.	5	8	8½	6⅞ — 7¼ xd	..	5 17 3
Do. 5 % Pref.	5	5	5	4¾ — 5⅛	..	4 13 0
Calgary Power, 1st Mort. Bds.	100	5	5	96 — 98	..	5 2 0
Canadian Gen. El. Com. ..	$100	6	6	111 —114	..	5 5 3
Do. 7 % Pref.	$100	7	7	121 —124	..	5 12 11
Cordoba Lt., Power and T., Ord.	1	..	6	1/32 — 1/16	..	6 8 0
Do. 5 % Deb.	100	5	5	93 — 96	..	5 4 2
Elec. Lt. and P. of Cochabamba, 6 % Bonds	100	..	6	97½ — 99½	..	6 0 7
Elec. Supply Victoria, 5 % 1st Mort. Deb.	100	5	5	87 — 90	..	5 11 1
Elec. Dev. Ontario, 5 % 1st Mort. Bonds	$500	5	5	83½ — 85½	..	5 17 0
Kalgoorlie Elec. P. and L., Ord.	10/-	Nil	Nil	1/16 — 3/16	..	..
Do. 6 % Pref.	1	6	6	13/16 — 15/16	..	8 6 8
Kaministiquia Power, 5 % G. Bs.	$500	5	5	103½ —105½	+ ½	4 14 9
Madras, Ord.	5	Nil	Nil	3 — 3½	..	..
Melbourne, 5 % 1st Mort. Deb.	100	5	5	94 — 96	..	5 4 9
Mexican El. Lt., 5 % 1st M. Bds.	..	5	5	89 — 90	..	5 11 1
Mexican Lt. & Power, Common	$100	4	4†	84½ — 86½	..	4 12 6
Do. 7 % Cum. Pref.	$100	7	7	107 —109	—1	6 8 5
Do. 5 % 1st Mort. Gold Bds.	..	5	5	94½ — 95½	+ ½	5 5 0
Monterey Rly. Light & Power, 5 % 1st Mort. Deb.	100	5	5	89½ — 91½	..	5 9 3
Montreal, Lt., H. and Power ..	$100	..	8	162 —165	+8	4 17 0
Northern, Lt., Power and Coal, 5 % 1st Mort. Bonds	$500	5	5	70 — 72	—1	6 18 11
River Plate, Ord.	Stock	9	10	218 —228	..	4 7 9
Do. 6 % Non-Cum. Pref. ..	Do.	6	6	107 —114	..	5 5 3
Do. 5 % Deb. Stock	Do.	5	5	104 —106	..	4 15 3
Roy. Elec. Co., Montreal, 4½ % 1st Mort. Deb.	100	4½	4½	100 —102	..	4 8 3
Shawinigan Water, Capital ..	$100	5	5	115 —118	..	4 4 9
Do. 5 % Con. 1st Mort. Bonds	$500	5	5	109 —111	+ ½	4 10 1
Do. 4½ % Per. Deb.	Stock	4½	4½	102 —104	..	4 6 7
Toronto Power, 4½ % Deb. ..	Do.	4½	4½	101 —103	..	4 8 3
Vera Cruz Lt., P. and T., 5 % 1st Mort. Deb.	100	5	5	93 — 95	..	5 5 3
Victoria Falls Power, Pref. ..	1	Nil	Nil	3/16 — 1/32	+ 1/32	Nil
Do. (new)	1	..	Nil	1/16 — 1/8	+ 1/32	Nil
West Kootenay Power and Lt., 1st Mort. 6 % Gold	100	..	6	108 —110	..	5 9 1

TELEGRAPH AND TELEPHONE COMPANIES.

Amazon Telegraph	10	Nil	Nil	7⅜ — 7⅞	..	Nil.
Do. 5 % Deb. Red.	Stock	5	5	99½ —101½	..	4 18 6
American Telep. & Teleg., Cap.	$100	8	8	152½ —154½	..	5 3 7
Do. Collat. Trust	$1000	4	4	95⅝ — 97⅝	..	4 2 1
Anglo-American Telegraph ..	Stock	3⅝	3⅝	69 — 71	..	5 5 8
Do. 6 % Pref.	Do.	6	6	113½ —114½	..	5 4 10
Do. Def.	Do.	25/-	30/-	26½ — 27	..	5 11 1
Anglo-Portuguese Tel., 5 % Mort. Deb.	100	5	5	101 —103	..	4 17 1
Chili Telephone	5	8	6†	7 1/16 — 7 5/16	..	5 11 11
Commercial Cable, Stlg. 4 % Deb.	Stock	4	4	88 — 90	..	4 8 11
Cuba Telegraph	10	6	6	9⅞ — 10½	..	5 14 3
Do. 10 % Pref.	10	10	10	17⅜ — 18½	..	5 9 7
Direct Spanish Telegraph, Ord.	5	4	4	3⅞ — 4	..	5 0 0
Do. 10 % Cum. Pref.	5	10	10	8⅞ — 9⅞	..	5 14 3
Do. 4½ % Debs.	50	4½	4½	101 —103	..	4 7 5
Direct United States Cable ..	10	4	5	7⅞ — 8⅜	..	6 3 1
Direct W. India Cable, 4½ % Reg. Deb.	100	4½	4½	100 —102	..	4 9 1
Eastern Telegraph, Ord. Stock	Stock	7	7	137 —140	—3	5 0 0
Do. 3½ % Pref. Stock.. ..	Do.	3½	3½	84 — 86 ex	+ ¼	4 1 5
Do. 4 % Mort. Deb.	Do.	4	4	100⅛ —102½	..	3 18 1
Eastern Extension	10	7	7	13¾ — 14	— ¼	5 0 0
Do. 4 % Deb.	Stock	4	4	101 —103	..	3 17 8
East and S. Africa Tel. 4 % Mt. Db. Mauritius Sub.	25	4	4	99½ —101½	..	3 18 10
Globe Telegraph and Trust ..	10	5⅞	5⅞	11¼ — 11⅝	+ ⅛	5 0 0
Do. 6 % Pref.	10	6	6	13⅛ — 13⅝	..	4 8 1
Great Northern Telegraph ..	10	18	18	31⅜ — 32½	..	5 10 9
Indo-European Telegraph ..	25	13	13	56½ — 58½	..	5 11 1
Mackay Companies Common ..	$100	4½	5	93 — 96	..	5 3 1
Do. 4 % Cum. Pref.	$100	4	4	78 — 80	..	5 0 0
Marconi's Wireless Telegraph	1	Nil	Nil	1⅜ — 1⅝	+ ⅛	Nil.
Monte Video Telephone, Ord...	1	6	6	⅞ — 1	..	6 0 0
Do. 5 % Pref.	1	5	5	¾ — ⅞	..	5 10 4
National Telephone, Pref. ..	Stock	6	6	104 —105	..	5 14 3
Do. Def.	Do.	6	6	127 —129	..	4 13 0
Do. 6 % Cum. 1st Pref. ..	10	6	6	10 — 10⅜	..	5 11 7
Do. 6 % Cum. 2nd Pref. ..	10	6	6	10 — 10⅜	..	5 11 7
Do. 5 % Non-cum. 3rd Pref.	5	5	5	5⅛ — 5⅜	..	4 6 11
Do. 3½ % Deb.	Stock	3½	3½	99 —101	..	3 9 4
Do. 4 % Deb.	Do	4	4	99 —101	..	3 19 2
New York Telep., 4½ % Gen. Bnds.	100	4½	4½	99½ —100½	+ ½	4 9 7
Oriental Telep. and Elec. ..	1	8	6†	1 1/16 — 1 1/16	..	4 8 3
Do. 6 % Cum. Pref.	1	6	6	1 1/16 — 1 1/8	..	4 16 0
Do. 4 % Red. Deb. ..	Stock	4	4	87½ — 89½	..	4 9 5
Pacific and European Tel., 4 % Guar. Debs.	Do.	4	4	100 —102	..	3 18 5
Reuter's	8	5	5	8⅛ — 8⅝ xd	+ 1/16	4 12 10
Submarine Cables Trust ..	Cert.	6	6	131 —134	..	4 9 7
Telephone Co. of Egypt, 4½ % Deb. Red.	Stock	4½	4½	100 —102	..	4 8 3
United River Plate Telephone	5	8	6†	7 1/16 — 7 1/8	..	5 2 5
Do. 5 % Cum. Pref.	5	5	5	5⅛ — 5⅜	..	4 8 11
West Coast of America	2½	2½	2½	1⅛ — 1⅜ xd	— 1/16	6 5 0
Do. 4 % Debs., 1 to 1,500 guar. by Braz. Sub. Tel.	100	4	4	99½ —101½	..	3 18 10
West India and Panama Teleg.	10	Nil	2	2⅛ — 2 3/16 xd	..	7 16 1
Do. 6 % Cum. 1st Pref. ..	10	6	6	10⅛ — 10⅜ xd	..	5 12 11
Do. 6 % Cum. 2nd Pref. ..	10	14½	6	9⅜ — 9⅝ xd	..	6 1 6
Do. 5 % Debs.	100	5	5	102 —104	..	4 16 2
Western Telegraph, Ltd. ..	10	7	7	13¾ — 14½	..	4 18 3
Do. 4 % Deb.	Stock	4	4	101 —103	..	3 18 10
Western Union Tel., 4 % Bnds. A	$1000	4	4	105 —108	..	3 14 1
Do. 4½ % Fdg. Bonds.. ..	$1000	4½	4½	99½ —102½	..	4 7 10

* Unless otherwise stated, all shares are fully paid. † Interim dividend.

Continued on next page.

SHARE LIST OF ELECTRICAL COMPANIES.—(*Continued.*)

ELECTRIC RAILWAYS AND TRAMWAYS.—HOME.

NAME.	Stock or Share.	Dividends for 1909.	Dividends for 1910.	Closing Quotations June 6th.	Rise + or Fall —	Present Yield p.c.
	*					£ s. d.
Bath Trams, Pref. Ord.	1	Nil	Nil	⅛ — ⅝	..	Nil
Do. 5 % Pref.	1	5	5	⅜ — ½	..	6 13 4
Do. 4½ % Deb.	100	4½	4½	79 — 83	..	5 8 5
Brit. Elec. Trac., Ord.	10	Nil	Nil	1⅜ — 1⅝	..	Nil
Do. 6 % Pref.	10	3	..	4 — 4½	..	..
Do. 5 % Deb.	100	5	5	94 — 98	..	5 2 0
Do. 4½ % 2nd Deb.	100	4½	4½	75 — 80	..	5 12 6
Central London Railway, Ord.	100	3	3	73 — 75	..	4 0 0
Do. Pref.	100	4	4	87 — 89	..	4 9 11
Do. Def.	100	2	2	62 — 64	..	3 2 6
Do. 4 % Deb.	100	4	4	104 —106	..	3 15 6
City & South London, Ord.	100	1½	1½	32½ — 33½	— ½	4 9 7
Do. 5 % Pref., 1891	100	5	5	109 —111	..	4 10 1
Do. Do. 1896	100	5	5	104 —106	..	4 14 4
Do. Do. 1901	100	5	5	103 —106	..	4 14 4
Do. Do. 1903	100	5	5	103 —106	..	4 14 4
Do. 4 % Deb.	100	4	4	101 —103	..	3 17 8
Dublin United Trams, 6 % Pref.	10	6	6	12½ — 13½	..	4 10 7
Great Northern & City, Pr'f. Ord	10	Nil	Nil	¾ — 1⅛	..	Nil
Hastings Trams, 6 % Pref.	5	Nil	Nil	1½ — 2	..	Nil
Do. 4½ % Deb.	100	4½	4½	75 — 80	..	5 12 6
Isle of Thanet Trams, 5 % Pref.	5	1½	2½	2¼ — 2¾	..	4 10 11
Do. 4 % Deb.	100	4	4	79 — 84	..	4 15 3
Lancashire United, 5 % Deb.	100	5	5	82 — 84	..	5 19 1
London Elec. Railw'ys, 4 % Deb.	100	4	4	98 —100	..	4 0 0
London United Trams, 5 % Pref.	10	Nil	Nil	3¾ — 4¼	..	Nil
Do. 4 % Deb.	100	4	4	76 — 79	..	5 1 3
Metropolitan Railway Consol.	100	1	1⅛	50¾ — 51½	— ½	2 13 7
Do. Surplus Lands	100	2⅜	2⅜	68 — 70	..	3 18 7
Do. 3½ % Deb.	100	3½	3½	93 — 95	..	3 13 8
Do. 3½ % Pref.	100	3½	3½	90 — 92	..	3 16 1
Do. 3½ % Con. Pref.	100	3½	3½	89 — 91	..	3 16 11
Metropolitan District Ord.	100	Nil	Nil	32 — 32½	..	Nil
Do. 6 % Deb.	100	6	6	148 —150	..	4 0 0
Do. 4 % Deb.	100	4	4	98 —100	..	4 0 0
Do. 4 % Prior Lien	100	4	4	102 —104	..	3 16 11
Do. 4½ % First Pref.	100	..	3½	89 — 91	..	3 11 5
Do. 3½ % Gtd.	100	3½	3½	75 — 77	..	4 10 11
Metropolitan Elec. Trams, Ord.	1	5	5½	32/32 — 1 1/32	..	5 6 8
Do. Def.	1	Nil	Nil	1/32 — 1/16	..	Nil
Do. 5 % Pref.	1	5	5	29/32 — 1 1/32	..	4 17 0
Do. 4½ % Deb.	100	4½	4½	102½ —104½	..	4 6 2
Do. 5 % Deb.	100	5	5	100½ —103½	..	4 16 7
Potteries, Ord.	1	2	..	1/32 — 3/32	..	..
Do. 5 % Pref.	1	5	5	15/32 — 23/32	..	6 19 2
Do. 4½ % Deb.	100	4½	4½	86 — 89 xd	..	5 1 2
South Metro. Trams, 6 % Pref.	1	3	..	13/32 — 19/32	..	..
Do. 4 % Deb.	100	4	4	75 — 80	..	5 0 0
Underground Elec. Railways 5 % Prior Lien	..	5	5	100 —101	..	4 19 0
Do. 4½ % Bonds	100	4½	4½	99 —101	..	4 9 1
Do. 6 % Income	100	Nil	10/-	63 — 65	..	0 15 4
Do. Power House Debs.	100	..	4	100 —102	..	3 18 5
Yorkshire (West Riding), Ord.	5	Nil	Nil	⅛ — ¼	..	Nil
Do. 6 % Pref.	5	Nil	Nil	2⅜ — 2⅞	..	..
Do. 4½ % Deb.	100	4½	4½	84 — 87	..	5 3 6

ELECTRICAL RAILWAYS AND TRAMWAYS.—COLONIAL AND FOREIGN.

Anglo-Arg. Trams, 1st Pref.	5	5	5	5 — 5¼	..	4 15 3
Do. 2nd Pref.	5	5	5	4⅞ — 5⅛	..	4 17 7
Do. 4 % Deb.	100	4	4	96 — 98	..	4 1 8
Do. 4½ % Deb.	100	4½	4½	101 —103	..	4 7 5
Do. 5 % Deb.	100	5	5	100 —102½ xd	..	4 15 3
Auckland Trams, 5 % Deb.	100	5	5	104½ —106½	..	4 13 11
Bombay Elec. S. & Trams, Pref.	10	6	6	10¾ — 11¼	..	5 6 8
Do. 4½ % Deb.	100	4½	4½	98 —100	+ ½	4 10 0
Do. 5 % 2nd Deb.	100	5	5	98 —100	..	5 0 0
Brisbane Trams Invt., Ord.	5	8½	8†	6¼ — 6⅝	..	6 5 11
Do. 5 % Pref.	5	5	5	5 — 5⅛	..	4 13 0
Do. 4½ % Deb.	100	4½	4½	102 —105	..	4 5 9
B. Columbia Elec. Rly., Def.	100	8	8	146 —150	..	5 6 8
Do. Pref. Ord.	100	6	6	127 —130	+1	4 12 4
Do. 5 % Pref.	100	5	5	109 —112	..	4 9 3
Do. 4½ % 1st Mort. Deb.	40	4½	4½	100 —103	..	4 7 5
Do. 4½ % Vancouver Deb.	100	4½	4½	102 —105	..	4 5 9
Do. 4½ % Con. Deb.	100	4½	4½	101½ —103½	..	4 7 0
Calcutta Trams, Ord.	5	4½	5	5½ — 6	..	4 3 4
Do. 5 % Pref.	5	5	5	5¼ — 5⅜	..	4 13 0
Do. 4½ % Deb.	100	4½	4½	101 —104	..	4 6 7
Cape Electric Trams	1	Nil	Nil	1/16 — 11/16	— 1/16	Nil
City Buenos Aires Trams (1904)	5	5	5	5⅜ — 5⅝	..	4 5 1
Do. 4 % Deb.	100	5	5	96 — 99	..	5 1 0
Colombo Elec. Tr. & Lt., 5 % Deb.	100	5	5	95 — 98	..	5 2 0
Havana Elec. Rly., 5 % Bonds	$1000	5	5	100½ —102½	..	4 17 7
Kalgoorlie Elec. Trams	1	Nil	Nil	3/32 — 5/32	..	Nil
Do. 5 % A Deb.	100	5	5	94 — 97	..	5 3 1
Do. 6 % B Deb.	100	6	5	66 — 70	..	7 2 10
La Plata Elec. Trms, Prf, 17/6 pd.	1	6	6	13/16 — 15/16	..	6 8 0
Lisbon Elec. Trams, Ord.	1	6	6	1 — 1⅛	..	4 16 0
Do. 6 % Pref.	1	6	6	1 — 1⅛	..	4 16 0
Do. 5 % Deb.	100	5	5	98 —102	..	4 18 0
Madras Elec. Tr. (1904), Deb.	100	5	5	96 — 98	..	5 2 0
Manaos Trams & Lt., 1st Deb.	100	..	5	94 — 97	..	5 3 1
Manila Elec. R. and Ltg., Bonds	$1000	5	5	100 —102	..	4 18 0
Mexico Trams Com.	$100	6	7	123 —125	—1	5 12 0
Do. Gen. Con. 5 % Bonds	..	5	5	96 — 97	..	5 3 1
Do. 6 % Bonds	100	6	6	100¾ —101¾	— ¼	5 17 11
Para Elec. Rlys. & Lt., Ord.	5	..	10	7 — 7½	..	6 17 11
Do. 6 % Pref.	5	6	6	5⅝ — 5¾	..	5 2 2
Do. 5 % 1st Deb.	100	5	5	99 —101 xd	..	4 19 0
Perth (W.A.) Elec. Tr., Ord.	1	2½	..	1⅛ — 1⅜	..	2 13 4
Do. 5 % 1st. Deb.	100	5	5	104 —106	..	4 14 4
Rangoon El. Tr. & Sup., Pref.	5	6	6	5½ — 5⅔	..	5 4 4
Do. 4½ % 1st Deb.	100	4½	4½	99 —102	..	4 8 3
Rio de Janeiro Trams	$100	2	5	116½ —117½	+2⅔	4 5 3
Do. 1st Mort. 5 % Bonds	..	5	5	103 —104	..	4 16 2
Do. 5 % Mort. Bonds	100	5	5	96 — 97	— ¼	5 3 1
Sao Paulo Tram, Lt. and P.	$100	10	10	185 —187	+8	5 6 11
Do. 5 % 1st Deb.	$500	5	5	102 —104 xd	..	4 16 2
Singapore Trams, 5 % Deb.	100	5	5	82 — 86	..	5 16 3
Southern El. Tr. B.A., 5 % Deb.	..	5	5	97 — 99	..	5 1 0
Un. Elec. Trams Monte Video	5	7	6†	5½ — 6½	..	5 7 8
Do. 6 % Pref.	5	6	5	5 — 5½	..	4 10 11
Do. 5 % 1st Deb.	100	5	6	101 —104	..	5 15 5
Winnipeg Elec. Rly., 4½ % Deb.	100	4½	4½	105½ —107½	..	4 3 9

MANUFACTURING COMPANIES.

Aron, Ord.	1	..	..	3/32 — 7/32	+ 3/32	..
Do. 6 % Pref.	1	12	9	3⅝ — 3¾	+ 1/16	6 17 11
Babcock & Wilcox	1	24	20†	5¼ — 5⅜	+ 1/8	4 5 4
Do. Pref.	1	6	6	1⅜ — 1⅝	..	4 0 0
B.I. & Helsby Cables	5	10	10	6⅞ — 7⅛	..	6 15 7
Do. Pref.	5	6	6	6 — 6⅛	..	4 12 4
Do. Deb.	100	4½	4½	102 —104	..	4 6 7
British Thomson-Houston, Deb.	100	4½	4½	96 — 99	..	4 10 11
British Westinghouse, Pref.	3	Nil	Nil	1/32 — 3/32	..	Nil
Do. Deb.	100	4	4	61 — 64	..	6 5 0
Do. 6 % Prior Lien	100	6	6	100 —103	..	5 16 6
Browett, Lindley, Ord.	1	Nil	Nil	3/32 — 1/8	..	Nil
Do. Pref.	1	Nil	Nil	14/6—15/6	..	Nil
Brush, Ord.	2	Nil	Nil	¼ — ⅜	..	Nil
Do. 7 % Pref.	2	Nil	Nil	⅛ — ⅜	..	Nil
Do. 4½ % Deb.	100	4½	4½	59 — 64	..	7 0 8
Do. 4½ % Second Deb.	100	4½	4½	41 — 46	..	9 15 7
Callender's Cable	5	15	10†	9⅜ — 9⅝	..	7 13 5
Do. Pref.	5	5	5	4¾ — 5⅛	..	4 17 7
Do. Deb.	100	4½	4½	102 —104	..	4 6 7
Castner-Kellner	1	17½	7½†	34⅜ — 34¾	..	4 19 2
Do. Deb.	100	4½	4½	103 —106	..	4 4 11
Crompton & Co.	3	Nil	Nil	⅛ — ⅜	..	Nil
Do. Deb.	100	5	5	70 — 80	..	6 5 0
Dick, Kerr	1	5	6	¾ — 1	..	6 0 0
Do. Pref.	1	6	6	1 — 1⅛	..	5 6 8
Do. Deb.	100	4½	4½	97 —100	..	4 10 0
Edison & Swan, A, £3 paid	5	Nil	Nil	1/32 — 3/32	+ 3/32	Nil
Do. fully paid	5	Nil	Nil	1⅛ — 2⅛	..	Nil
Do. 4 % Deb.	100	4	4	69 — 73	..	5 9 7
Do. 5 % Second Deb.	100	5	5	78 — 81	..	6 3 5
Electric Construction	2	Nil	Nil	3/32 — 1	..	Nil
Do. Pref.	2	7	7	1⅞ — 2	..	7 0 0
Greenwood & Batley, Pref.	10	7	7	10¼ — 10⅜	..	6 10 3
Do. Deb.	100	5	5	102 —103¼	..	4 16 7
General Electric, Pref.	10	5	5	8⅜ — 9¼	..	5 8 1
Do. Deb.	100	4	4	88 — 93	..	4 6 0
Henley's, Ord.	5	15	15	12¼ — 12⅞	..	5 16 6
Do. Pref.	5	4½	4½	4⅛ — 5⅛	..	4 6 9
Do. Deb.	100	4½	4½	106 —108 xd	+ ¼	4 3 4
India-Rubber, G. & T.	10	10	10	16 — 16⅜	..	5 19 5
Do. Pref.	10	5	5	10⅜ — 10⅝	..	4 13 0
Telegraph Construction	12	17½	20	36½ — 38½	..	6 5 0
Do. Deb.	100	4	4	100 —102	..	3 18 5
Willans & Robinson	1	Nil	Nil	⅛ — ⅜	..	Nil
Do. Pref.	5	3	Nil	⅜ — 1	..	Nil
Do. Deb.	100	4	4	55 — 65	..	6 3 1

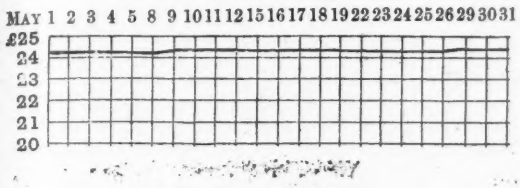
* Unless otherwise stated, all shares are fully paid. † Interim dividend.

Bank rate of Discount 3 per cent., March 9th, 1911.

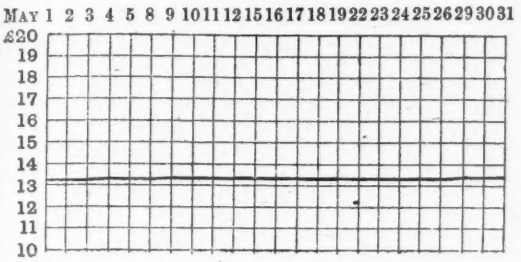
METAL MARKET.

Fluctuations in May.

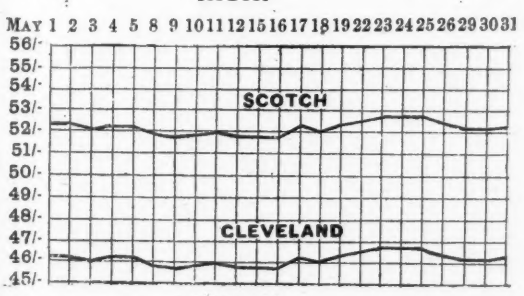
SPELTER (G.O.B's.).



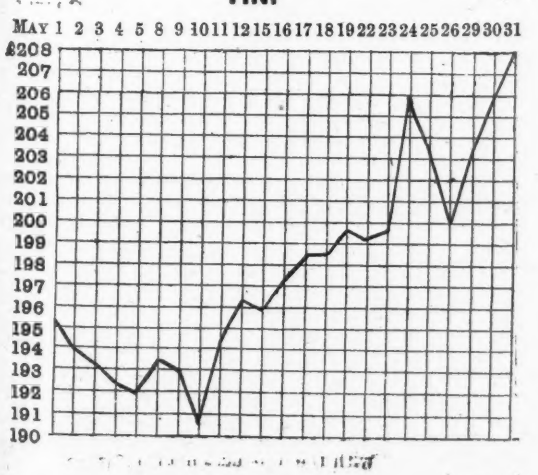
LEAD (ENGLISH).



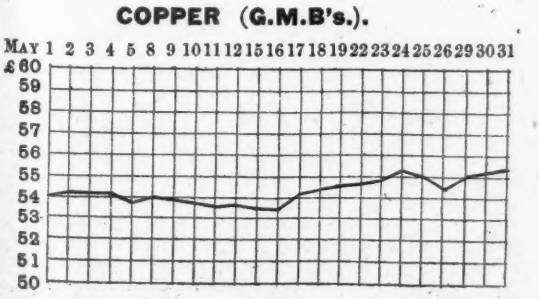
IRON.



TIN.



COPPER (G.M.B's.).



REVIEWS.

The Law Relating to Electrical Energy in India. By J. W. MEARES, M.Inst.C.E., Electrical Adviser to the Government of India, assisted by H. N. BLOMFIELD, solicitor. Calcutta: Government of India Central Press. Price Rs. 10.

Who would have thought 30 years ago that the cause of electricity would have advanced so materially by the year 1911, as to justify the production of a large volume dealing with the Indian law upon the subject? Yet so it is! The volume before us is really in the nature of a second edition of the authors' work on "Indian Electricity Act, 1903," that measure having been repealed and re-enacted, with certain important modifications, by the Act of 1910.

One reason for that repeal is made clear on page 11 of the present volume. An application was made by a company for a licence to supply electrical energy generally, and also "in bulk to authorised distributors." The draft licence, being the first of its kind, was referred to the Advocate-General, Bengal, for his opinion, and he held that such a licence was outside the scope of the Act and could not be granted. This opinion was the immediate cause which led to the revision of the Act.

The object of the author in producing the present volume has been to cater alike for the lawyer, whose knowledge of electrical engineering is limited, and for the electrical engineer whose knowledge of law is *nil*. Special attention is paid to questions affecting railways and tramways, and the procedure in the matter of acquiring land is explained. A separate chapter is assigned to the General Clauses Act, 1897, which has to be read in conjunction with all enactments of the Governor-General in Council. Extracts have been made from "The Law relating to Electric Lighting, Traction and Power," by the late Mr. Shiress Will, K.C., where the law of India approximates to that of Great Britain.

The notes on clauses form an exceptionally useful feature of this work, for which the author is indebted to Mr. H. N. Blomfield.

Although English decisions may not have a decisive bearing upon nice points arising upon the construction of the Indian statute, the author has, nevertheless, thought it worth while to refer to many of them in his text. In these circumstances, it is surprising to find that he has inserted no "Table of Cases," which is a usual, and most useful, feature of every law book. An exceedingly good index, however, will probably serve to remedy a minor defect in a work which, we feel sure, will be most serviceable to those for whom it was written.

A Treatise on Electrical Theory and the Problem of the Universe. By G. W. DE TUNZELMANN, B.Sc. London: Charles Griffin & Co., Ltd. Price 15s. net.

We are told in the preface: "The primary aim of this treatise is to develop as complete a presentation of the existing state of electrical theory as can be effected without demanding, on the part of the reader, any further mathematical attainments than the elementary acquaintance with simple methods which may be regarded as the minimum equipment of the student of physics." This statement will perhaps give as satisfactory an explanation of what the book aims to be and to do, as any more elaborate explanation by the reviewer. For, to tell the truth, when one comes across such a work as the present, with its remarkable and varied contents, its broad and world-embracing theme, and its attempted solution of creation from electrical data, one is at a loss to know exactly where to commence, or what to lay hold of, in order to give the prospective purchaser a fair idea of its contents.

The reviewer has found this treatise on electrical theory and the problem of the universe, but especially the latter portion, the most fascinating and interesting thing he has come across for many a long day. It brings together all our present knowledge on the theory of electricity. It is, of course, *not* a book for the practical man, though the author makes some pretensions that way; it is essentially the book for the theorist; for the man who, having always had a keen interest in the theory of electricity, has started amazed at the recent discoveries on the borderland of physics and chemistry; who enjoys reading about the marvellous electrons and their amazing miniature solar systems; who, in fact, is not necessarily an electrical engineer at all, but who, from some innate instinct, has pleasure in reading of these things.

It is very hard to state what the object of the book is exactly. It seems to be an attempt to set down, in as successive a form as may be, the very latest and most up-to-date conceptions in the theory of electricity; to develop along such lines the modern speculations on the conception of matter; and, finally, to trace back, into the most speculative field of all, the reason for the creation of matter and the personality of the Being who created it. From all of which it will be seen that the author has set himself a difficult task, and one seldom attempted with electricity and physics as the base from which to start.

The book can be sharply separated into two distinct portions: one, which deals with known facts deduced both mathematically and experimentally; and another, which is purely speculative. Both are absorbingly interesting, the former because practically everything of the very latest date that is known upon the constitution of matter, the ether, and the absolute elements of electricity, has been included, and the latter because of the fresh method and novel direction in which the mysteries of life have been attacked.

The first few chapters contain nothing of any note. Chapter IV is where the real interest commences, with a long dissertation upon the ether. It reviews Lord Kelvin's vortex theory, and discourses on wave stresses of light, heat and electricity; in the next chapter the ether as a framework for absolute motions is considered; then come "relations between ether and moving matter" and "conduction in gases and dielectrics;" in the latter, ionisation by incandescent solids, by flames and by light is fully treated. Then comes a chapter on the Faraday-Maxwell theory, treated with the minimum of mathematics; next the electron theory (and this chapter is of such length, that it is really a treatise in itself); then comes "magnetism and the dissipation of energy," then "contact electrification and electrolysis," "optical phenomena," "the mechanism of radiation," "metallic conduction and radiation," "general phenomena of radioactivity," "transmutations of radio-active substances," "the ages of the earth and sun," "the solar corona, aurora and comets' tails," "radio-activity in stars and nebulæ," "arrangement and number of electrons in an atom," "changes in the aspect of fundamental mechanical principles," and "gravitation and cohesion." This comprises the first portion into which the book may be divided, and, as will be seen by the mere enumeration of the subjects, contains a very great deal of matter of really absorbing interest. All the authorities for the various facts cited are freely given, along with, in many cases, references to the original papers; much of the matter is readable by the student of comparatively small attainments in mathematics, and wherever the mathematics become difficult the subjects are further discussed in appendices.

The second or speculative portion of the volume is compressed into the last chapter of about 60 pages, and is headed "The Place of Mind in the Universe." It enunciates a theory of "universal mind." In a few words, it states that behind the mechanical, molecular and energy configurations of the universe, there exists another configuration or system, just as omnipresent, but further off from our comprehension and intelligence, to be known as the "mind" system. This "mind" configuration is as much bound up with the universe, or even more so, as is the "ether" of space. This "mind" is the directive force that everybody except Haeckel believes to be present somewhere or other, and we know it in two forms: the first, in which it directs inanimate matter, and the second, when it develops into "life." Life is the first derivative of universal mind; that is, speaking mathematically, we differentiate the universal mind, and we find life developing in its elementary forms, such as in the Monera. This is a brief statement of what the theory amounts to, and it is not so important in itself, as it is for the various arguments and quotations from famous thinkers and scientists that lead up to it, such as, for instance, the discussions on the law of the dissipation of energy.

The arguments that lead up to the conclusion that there *is* external directive action developed on things and persons in this world are well put, and most readers will be inclined to agree with the author on this portion of his work; the conclusion, however, of "Universal Mind" is another matter. There is a difficulty in saying exactly where it lies, but the conclusion seems unreal and unconvincing.

However that may be, the reader has undoubtedly to thank the author for a very painstaking and very interesting book. It has only one fault. The style is too precise, too measured. Much of the work is of quite a popular character, and it is quite unnecessary to write a sentence in such a way, that it is necessary to go over it twice before you understand it. Just a little less rigidity of style and an endeavour to put at least simple matters in simple language are well worth the attention of writers of *all* scientific works.

A Treatise on Electro-Metallurgy. By WALTER G. MCMILLAN, F.I.C., M.I.M.M. Third edition. Revised and enlarged by W. R. COOPER, M.A., B.Sc., A.I.C. London, 1910: Charles Griffin & Co., Ltd. Price 12s. 6d. net.

The late Mr. W. G. McMillan's "Treatise on Electro-Metallurgy" has always been an indispensable handbook to everybody practically interested in any of the various branches of electrolysis, on account of the comparative poverty of the English literature on the subject, no less than because of its intrinsic merits, and we therefore cordially welcome the present edition, which has been ably edited and brought up to date by Mr. W. R. Cooper.

Considerable as are Mr. Cooper's additions, he has not attempted to modify the general outlines of the book, so that it still deals rather with electroplating and electrotyping than with electrometallurgy proper, by which we understand the electrolytic refining and extraction of metals. It was the latter—the electrometallurgical—sections, however, which most needed amplifying, and Mr. Cooper, while still eschewing a detailed consideration of this part of the subject, has succeeded in giving a very concise outline of what is at present being done in this fruitful and rapidly-developing field. The section on the Electro-Thermal Production and Refining of Iron is entirely from the pen of the present editor, and although quite short, is admirably fair in tone, and it well covers the present state of the art, as far as this is possible in processes whose applications are being extended almost daily by leaps and bounds. The experimental work that has been carried on for the past few years in America, notably by Prof. Burgess, at Wisconsin, on the electrolytic refining of iron from aqueous solution—as copper is refined—suggests the possibility of commercial developments in this direction, and it is a pity, therefore, that no reference has been made to Prof. Burgess's work in the chapter on the Electro-deposition of Iron, which deals almost exclusively with the production of films for printing purposes.

The selections dealing with electro-deposition could, we think, have been compressed somewhat by the deletion of some of the preliminary sections on theory, matter which is easily accessible elsewhere. Mr. Cooper has already wisely omitted the section on dynamos. On the other hand, the book suffers throughout from the absence of references, which are really essential in a practical handbook. Did space permit, we could mention several valuable old empirical formulæ of the utmost value to electroplaters and electrotypers, now only to be found in the very old text-books, that certainly merited reference, if not reproduction.

This new edition of an old friend undoubtedly fills a gap in technical literature, collecting, as it does, so much scattered

information, and we can only express the hope that the art of electrometallurgy will make such rapid strides in the near future that it will not be long before another new edition will be called for, and that Mr. Cooper, who has special qualifications for the task, will again come forward and supply the need.

NOTES ON ELECTRIC STREET LIGHTING.

BY L. CROUCH.

(*Continued from page* 898.)

As to luminous efficiency, flame arc lamps are considerably the most efficient artificial sources of light yet discovered; how they compare with other luminous sources and with the theoretical mechanical equivalent of light (0·08 watt per C.P. (white light)—Drysdale) is shown in Table II :—

TABLE II.—LUMINOUS EFFICIENCY OF VARIOUS LAMPS.

Type of lamp.	Mean watts per C.P. = W.	Relative efficiency = 0·08 / W per cent.	Visible / total radn. per cent.	Visible / total energy per cent.
Carbon ...	3·50	2·29	3·20	2·70
Met. carbon	2·50	3·20	—	—
Osmium ...	1·65	4·85	—	—
Tantalum ...	1·65	4·85	8·50	4·87
Tungsten ...	1·20	6·68	9·10	5·36
Nernst ...	1·60	5·00	5·70	4·21
D.C. arc ...	0·85	9·40	8·10	5·60
A.C. arc ...	1·00	8·00	3·70	1·90
Enclosed arc	1·30	6·15	2·00	1·16
Flame arc ...	0·30	26·6	15·70	13·20

Voysey.

Columns 2 and 3 of the above table are of general application' but Columns 4 and 5 are based on tests of individual lamps.

The Cooper-Hewitt mercury lamp (·5—·6 watt per C.P.) is debarred from use in street lighting by the green colour of its rays; the Heræus quartz mercury vapour lamp can be run at an efficiency rising to 0·182 watt per C.P. by resorting to extreme incandescence of the vapour, but, when so operated, it is at present unsuited to the rough and variable conditions of street lighting. The colour of the light emitted is fairly white, owing to the high incandescence of the vapour. Recent forms of quartz-enclosed mercury vapour lamps—the construction and performance of which have been fully treated elsewhere in these columns* —have enormously enhanced the practical value of this illuminant.

Ordinary arc lamps, burning pure carbons, give a blueish-white light, which approaches the spectroscopic composition of daylight far more closely than does the light of flame arcs which, whether "white," "yellow" or "rose," naturally partakes chiefly of the bands of the spectrum of the salt used to impregnate the carbons; this spectrum being superposed on the fairly continuous spectrum, due to the crater incandescence, loses some of its individuality. The colour of flame arcs varies very widely with the impregnator employed, and the possibility of producing a light rich in red rays, and hence capable of penetrating smoke, mist and fog, marks a considerable advance on the older bluey-light of the simple arc†; the latter is powerful actinically, but of low penetrating power in a murky atmosphere.

The usual candle-power of individual lamps of various types is more fully considered later. (See also Table I.)

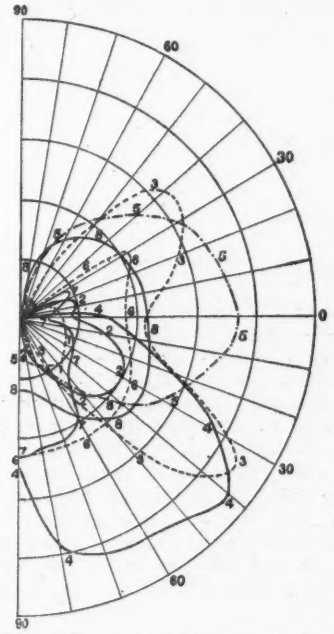
The polar distribution curve of arc lamps, whether of the vertical or inclined carbon type, is very suitable for street illumination. In figs. 3 and 4 are plotted, to common centres, typical vertical and horizontal distribution curves for various lamps. These curves are not to scale but suffice to show the general nature of the distribution effected. All illumination above the horizontal plane through the luminous source is wasted so far as street illumination is concerned, unless reflectors are fitted to recover a percentage of it. The lower hemispherical candle-power should be the rating of all lamps for street service. The C.P. in a direction inclined at 10° to the horizontal is of great importance in street lighting, and this candle-power is, relative to the M.H.C.P., considerably higher for filament lamps than for arc lamps with vertical carbons and still higher than for upright gas mantles. These statements are supported by the following experimental results :—

Mean horizontal candle-power, 100 C.P. throughout.

Candle-power 10° below horizontal :—

Carbon, tantalum and tungsten lamps ...	115 C.P. (mean)
Arc lamps (vertical carbons)	104 C.P. (mean)
Upright gas mantles	60 C.P. (mean)

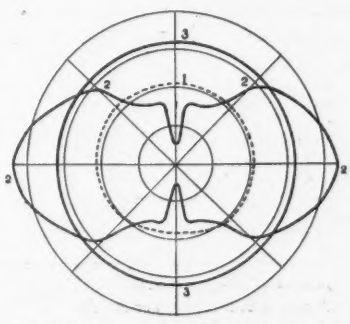
The "dioptric" globe—which is excellently illustrated in the ELECTRICAL REVIEW, Vol. 67, p. 1011 (among other



(1) Enclosed, (2) Open, (3) A.C., and (4) Flame arcs; (5) Met.-filt., (6) Nernst R. Ang. to filt., (7) Do., in plane of filt., (8) Carbon filt.

FIG. 3.—LIGHT DISTRIBUTION CURVES.

places)—has greatly improved street arc lighting by enabling a large percentage of the total light, from any arc, to be projected at from 10°—20° below the horizontal, thus avoiding



(1) 16 C.P. carbon; (2) Nernst, 1 horz. filt.; (3) Met.-filt. lamp.

FIG. 4.—LIGHT DISTRIBUTION CURVES.

over-illumination and dazzle near the lamps and raising the mean illumination between the latter.

The "spherical reduction factor" of the luminous source employed is closely allied to the nature of the candle-power distribution curve. This factor is defined to be the ratio between the mean spherical and the mean horizontal candle-powers of a lamp. A rough average value for the ratio is 75—80 per cent. Its theoretical value for a single straight horizontal filament, such as certain Nernst lamps use, is 78½ per cent. : its range in commercial lamps is from 60—90 per

* ELECTRICAL REVIEW, Vol. 67, pages 113, 616, &c.

† The Cheapside arcs, for instance, can be seen some 1,000 ft. away, even in a dense ground fog

cent. with the above figure as an average. With carbon-filament lamps the reduction factor is sensibly constant for all lamps of a given type, and, moreover, it does not appear to vary greatly with the age of the lamp. With tantalum, tungsten, and, in fact, all lamps employing a very long filament wound zig-zag between two "spiders" or "stars" to form a squirrel cage, the reduction factor is much less constant.* In the case of tantalum lamps which blacken *locally* with age, the reduction factor undergoes a considerable increase during the life of the lamp. In Table III are quoted the spherical reduction factors determined by the authorities cited.

TABLE III.—SPHERICAL REDUCTION FACTORS.

Type of lamp.	Voysey. %	Other authorities.	
		Per cent.	Authority.
Carbon ...	77·9	85·0	Harrison
Tantalum ...	77·1	68·8—76·4 new mean 72·6 new „ 89·7 old	Dr. Sharp
Tungsten ...	75·3	79·0	Remané (M.H.-S.C.P. = 82 % M.H.C.P.)
M. fils. as whole	—	80·0	Harrison
Nernst ...	79·0	—	—
D.C. arc ...	275·5	—	—
A.C. arc ...	81·6	—	—
Enclosed arc	147·5	—	—
Flame arc ...	126·1	—	—
Upright gas ...	83·8	—	—
Inverted gas...	76·9	—	—

As average values of the reduction factor may be taken 75·0 per cent. for glow lamps, 180 per cent. for D.C. arcs, 80-90 per cent. for A.C. arcs. The peculiar nature of the spherical reduction factor for arc lamps needs some comment. In D.C. arc lamps the M.S.C.P. will clearly be greater than the M.H.C.P., since the latter reaps practically no benefit from the incandescence of the crater, hence the high factor for D.C. open arcs. In flame arcs having inclined carbons, only a small projected area of the crater is operative horizontally; the reduction factor therefore $\propto$ 150-200 per cent., while even for A.C. arcs in which the horizontal illumination is relatively powerful (see fig. 3) the spherical reduction factor falls little below 100 per cent. or 80 per cent.

The intrinsic brightness of the arc crater is far greater than that of any incandescent filament or other commercial luminous source. This is shown by the data of Table IV, which needs little comment.

TABLE IV.—INTRINSIC BRIGHTNESS OF VARIOUS SOURCES.

Source.	Bougie per mm.^{2}	C.P. per in.^{2}
Sun	1,000	590,000
Crater of arc	160	94,500
Nernst	2·4 to 5·2	1,420 to 3,070
Tungsten	2·4	1,420
Tantalum	1·5	885
Osmium	1·2	710
Carbon	0·4 to 1·0	236 to 590
Cooper-Hewitt Hg. ...	·004 to ·007*	2·36 to 4·15*
Heræus Hg.	1·6 to 3·5	945 to 2,070
Moore vacuum ...	0·0016	0·95
Incandescent mantle ...	0·077	45·5

1 bougie per mm.^{2} = 590 C.P. per in.^{2}
1 C.P. per in.^{2} = 0·00155 bougie per mm.^{2}

* Kennard gives values as high as 0·025 bougie per mm.^{2} (14·8 C.P. per sq. in.).

It is a well established principle of illuminating engineering that the luminous source should not have too high an intrinsic brilliancy. This point, of very great importance in interior lighting, is far less so in street illumination owing to—

(*a*) The lamps being necessarily so placed that no direct illumination enters the eye except from very distant lamps (see also remarks *re* dioptric globes).

(*b*) The atmosphere is usually more or less misty at nights so that 20, 30 or 40 ft. of it together with the opalescence of the lamp globe (which is almost invariably slightly clouded —see later section) effectually prevents any dazzling glare even from the most powerful arc lamp.

2. *Nernst Lamps.*—It is in mechanical strength that Nernst lamps are chiefly deficient, though their electrical efficiency is low as gauged by modern lamp practice (see Table II). Before the advent of the metallic-filament lamp, the Nernst lamp was quite the most efficient low C.P. lamp available for street lighting and, but for the metallic-filament lamp, it would no doubt have been gradually perfected until quite satisfactory for street service. The Nernst lamp has, from its invention, been subject to many difficulties, electrical and mechanical; of these only the mechanical limitations persist to any serious degree, and no doubt these could be removed by continued endeavours. The higher efficiency and greater mechanical suitability of the metallic-filament lamp, together with the absence of necessity for ballast resistance, heating coil, &c., make it unlikely that Nernst lamps will continue to be used in street lighting. The continued decrease in the cost of metallic-filament lamps will further aid this tendency (see also Table I).

Many small towns are rapidly replacing Nernst by tantalum or tungsten lamps, but it may surprise some to learn that at least 1,700 Nernst lamps are still in use for street lighting in some 31 towns. Though the Nernst lamp is thus far from obsolete, its rapid replacement by metallic-filament types is to be anticipated as opportunity arises in each town.

The average life of Nernst lamp glowers in street service seems to vary from 200 up to 700—800 hours. The following figures appear to be representative of modern experience :—

Life of glower	400—800 burning hours.
„ heater	3,000 burning hours.
„ ballast resistance ...	10,000—15,000 burning hours.
„ screw burner ...	400—800 burning hours.

Not always, however, can such good results be anticipated. Owing to their fragility and liability to derangement (of cut-out, switch, &c.) Nernst lamps require more inspection and attendance than do other forms of electric "incandescent" lamps.

The colour of the light emitted by Nernst lamps is perhaps nearer to that of daylight than that of any other artificial light. The remaining characteristics of Nernst filaments requiring comment are set forth in Tables I—IV inclusive. It will be seen from the horizontal distribution curve of a single filament Nernst lamp (fig. 4), that this type is exactly suited to street work; the area illuminated is narrow and long and roughly rectangular.

The spherical reduction factor of a simple straight filament Nernst lamp approximates closely to the theoretical figure (78·5 per cent.), but if an opal or holophane globe or reflector be used, the exact factor must be experimentally determined in every case.

Nernst filaments deteriorate considerably with age; the C.P. may fall by 20—50 per cent. in the course of a 700—800-hour life, and ultimately the "lighting up" temperature of the filament becomes higher than the maximum producible by the heating coil or grid. As in most filament lamps, the performance of Nernst lamps depends greatly on the efficiency at which the glower is run. Raising the efficiency involves a higher intrinsic brilliancy of filament. Increasing the latter by 100—120 per cent. reduces the energy consumption to three-quarters or half its initial value; such improvements in efficiency are naturally accompanied by corresponding reductions in the life of the glower.

(*To be concluded.*)

* See Sharp, *Electrician*, July, 1906, page 492; Solomon "Electric Lamps," 1908, pages 187-9; McKinney, *I.E.E. Journal*, Vol 38, page 246.

Rubber Exhibition.—The Earl of Selborne, K.G., will open the International Rubber and Allied Trades Exhibition at the Royal Agricultural Hall on Monday, June 26th, at 3 p.m.

South Africa.—The Customs authorities of British South Africa have recently given a decision to the effect that insulating paper, leatheroid, and cloth for electrical purposes are to be classified under No. 98B of the tariff, the duty being at the rate of 3 per cent. *ad valorem*, with a rebate of a similar amount on goods of British manufacture.

PROCEEDINGS OF INSTITUTIONS.

The Mechanical Design of Induction Motors.

By H. L. Smith, A.M.Inst.C.E.

(*Abstract of paper read before the* Rugby Engineering Society, *March 30th*, 1911.)

Orders taken under a penalty have usually a good profit attached to them, and sometimes a bonus is offered for delivery by a certain date. If a firm can earn a bonus of £25 on a £200 order by high-speed delivery it makes a useful addition to the profit. Hence the importance of bringing intelligence to bear when drawing up a programme for a penalty order, for not only is it important to rush the limited drawings, but it is also important to refrain from rushing the parts that are not so urgent.

The first item to be put in hand on a special design is new slot dies. The form of slot in common use differs in different localities. Some firms prefer open rectangular slots, others completely closed slots, and others, again, a mean between the two. In giving instructions about slots, it is important to be perfectly definite in the terms used. Thus, in fig. 1, it is convenient to call dimension

Fig. 1. Fig. 2. Fig. 3.

A the depth of the slot, and to refer to dimension B separately as the depth of the bridge, for the reason that dimension A is a constant for each slot die, but dimension B can be varied by setting the slot back. Thus it might be that dimension B was half a millimetre commonly, but it could quite readily be increased to 1½ millimetres if necessary.

The next item to be put in hand after the slot dies is the punchings. The dies (fig. 2) for punching the centres of core plates are expensive, and when designing a line of machines a selection of dies should be formed at suitable intervals, and the core plates designed to use in a die from this selection. Here a large firm has the advantage over a small one, in that it can afford to arrange its series at closer intervals.

The die for the centre hole (fig. 3) would be separate from the die (fig. 2); also the diameters of the various sizes of stators and rotors would be arranged in regular sequence like a genealogical tree, so that the same die which is used for the gap of a large machine can be used for the outside diameter of a small one, the gap in the stator being the even dimension, and the allowance for air gap being put on by circular-shearing the rotor core plates.

In large built-up cores the punchings are interleaved, so that they all hang together like a continuous plate-link chain, being held in place by friction; the only stress of any importance on the bolt is that required to give the necessary pressure, which is about 30 lb. per sq. in., and the bolts should be designed large enough to give this.

The item next in urgency after the punchings is the stator frames.

The guiding principle to be borne in mind when designing any machine like an induction motor or a machine tool in which there are quick revolving parts running in a stationary frame, is that the frame should be cast-iron, and massive to resist vibration, and the revolving parts should be of wrought-iron, malleable steel, or similar material, and light; *e.g.*, in a sensitive drilling machine, it is the running parts that should be sensitive, the stationary parts being heavy to resist vibration. You cannot make the frame of a machine too strong; the only limit being cost.

Applying these principles to the several parts of an induction motor, we see that as regards:—

1. The frame; it should be cast-iron and massive.
2. The end shields should be cast-iron and massive, the ends being a flat plane and not an oblate cone.
3. The shaft should be of ample diameter.
4. The stator flanges should be ordinary cast-iron and massive, never malleable cast-iron.
5. The rotor flanges should be malleable cast-iron or even steel where necessary, and light.
6. The spider, being a part revolving at less peripheral speed than the flanges, can be ordinary cast-iron.

The side of the stator frame, near the bottom on each side should have a thick pad cast on inside for taking the terminal box, and in order to facilitate quick delivery, it should be so arranged that the frame can be put in hand straight away without having to wait for the arrangement of the terminal box to be finally fixed up. If the customer wants a machined joint, then let a cut be taken over the side of the stator frame.

As regards the important question of cost, it should not be lost sight of that a strong casting is cheaper to machine than a light one, because it can be gripped in the jig more firmly. A light casting in the machine shop is a thing which has to be put up with, and should be employed only when the engineering conditions demand it. But when the machine shop conditions and the engineering conditions both point towards a strong casting in preference to a light one, then there should not be any question which to adopt, any little extra cost of material and moulding being offset by greater ease of machining.

In order to avoid any confusion in the terms used, it is convenient always to refer to the bearing at the collector end of the machine as Bearing No. 1, the bearing at the driving end as Bearing No. II, and the outboard bearing as Bearing No. III. Thus, End Shield I is at the collector end of the machine and End Shield II at the driving end; Pedestal I is at the non-driving end, Pedestal II at the driving end and Pedestal III is the outboard or third bearing.

Also in making the drawings for a line of machines, it is a useful convention to put the No. I, or non-driving end, at the left-hand side of the paper throughout the series.

It is possible to recognise three grades of elaboration in design, viz.:—

Grade I, the plain plate style of designing.

Grade II, the rolled steel joist style.

Grade III, special for large structures or high-speed work.

In Grade I the patterns are cheap to make, and there is less slicking of the mould in the foundry; but there is more material used.

In Grade II the cost of the patterns is greater, also the cost of the moulding per ton of material; but the castings may be 10 times as strong, and leave the mould often as straight as a die, and therefore in a condition more likely to promote cheap machining; also, the castings being stronger, they can be held more firmly in the machine without fear of springing, and hence, as often as not, the extra slicking of the mould is offset by greater ease in machining.

Thus generally, Grade I of design would be used for stationary parts, or when there is only one article required off the pattern; Grade II for ordinary running parts, or when there are a fair number required off each pattern, while Grade III would be used when the speed is high or for repetition work, when the number of articles is so great that the cost of the patterns becomes negligible in comparison.

Figs. 4 and 5 are an example in point. They represent a cover for a terminal box, and may seem prosaic at first sight, but are important as illustrating a principle. The customer required the joint between the box and cover to be machined, and to have a thickness of packing between to keep out water and acid fumes. The number required off was 16, and the job could have been done

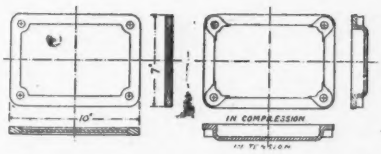


Fig. 4. Fig. 5.

in two ways, either according to Grade I, when the design would have appeared as in fig. 4, or according to Grade II, when it would have appeared as in fig. 5. Thus, figs. 4 and 5 represent identically the same article, designed after the two different styles. The outstanding features of each are:—For fig. 4, the pattern is cheaper and the moulding is cheaper, but there is more chance of warping; for fig. 5, the pattern is costly, but the job is 15 times as strong for the same weight of material, and, therefore, can be gripped more firmly in the machine, and leaves the mould as straight as a die.

Fig. 5 also illustrates, to a certain extent, another principle of mechanical design, viz., that the strongest way to bolt a box down is by the four corners.

It is a matter of common knowledge that a rolled steel joist is much stronger to resist a direct load than one applied laterally; and yet the section of the ordinary baseplate is that of a channel iron turned on its side with the web uppermost; or it may be compared to a flanged beam with the upper flange enormously increased and the lower flange removed altogether. The result is that such baseplates sometimes leave the foundry warped badly, requiring machining pads ¾ in. thick. It is only in the case of heavy work ordinarily that a baseplate is provided with lower flanges. The author has known cases in which a whole day and a night shift have been spent in chipping away the upper surface of a baseplate in order to prevent the planer tool from ploughing into the unmachined parts.

One of the best attempts that the author has seen recently to provide a baseplate with a lower flange is that of a firm of large gas engine makers, who make the frame-girders of their engines of a section as shown in fig. 6; but here they were so afraid of spoiling the appearance that they made the lower flange into the form of an oil drip-tray, and advertised it as a novelty of their design. The provision of a lower flange has also the advantage that it reduces the pressure on the concrete foundations. This pressure, in any case, should not exceed 4 tons per sq. ft., and, if it can be arranged to be less than this, so much the better.

Fig. 7 shows a long simple baseplate for a third bearing machine, and may be taken to represent what we may call a "basis design," the section being that of fig. 6; and, whatever the shape of the baseplate may be, this simple form should be retained throughout the design as the backbone of the structure, any widenings or hollowings-out necessary to take the stator frame being tacked on as additions.

If a hole has to be cut, as shown in fig. 8, to accommodate the

lower half of the stator frame, then the upper flange, being cast-iron in compression and very large, may be cranked ; but the lower flange, being cast-iron in tension and comparatively narrow, should be straight from end to end. The web also may be cranked, if necessary, without any very harmful results, when we get the section

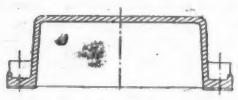
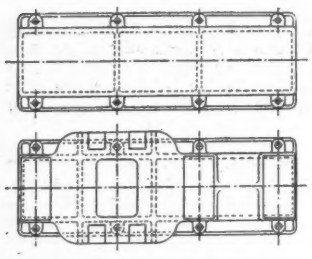


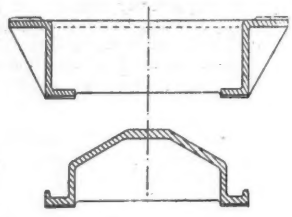
FIG. 6.

shown in fig. 9 for the middle of the baseplate, the section of the remainder being that of fig. 6. If it is necessary to cut away the upper flange at the pulley end for the passage of the belt, then the section of fig. 10 may be adopted without undue weakening, provided the depth be kept the same. But in any case the main structure of the baseplate should be kept intact, and the lower flange should be kept straight if possible, thus also making the slide-rails all the same length ; under which circumstances it would be possible to design baseplates about twice as stiff as at present for the same weight of metal.

Finally, the baseplate being a stationary portion of the machine and not standardised to any extent, should in general be designed on Grade I lines and massive ; but this depends to a certain extent



FIGS. 7 AND 8



FIGS. 9 AND 10.

upon the destination ; *e.g.*, if a machine has to go to Japan the design of the baseplate would be on Grade II lines, and different from what it would be if it had to go only to Coventry.

An important point to be borne in mind in designing shafts is that, since turning is one of the cheapest of manufacturing operations, and the shaft in point of peripheral speed comes within the slow-moving category, it should be of ample diameter.

The amount by which the spider is thrown out of centre owing to the deflection of the shaft due to the weight of the rotor, is dependent to a certain extent upon the class of fit of the spider upon the shaft. If the spider is a heavy force fit upon the shaft, then the portion of the shaft E F (fig. 11) inside the spider hub becomes one solid mass with the latter, and so is not appreciably deflected. Thus the effective length of the shaft subject to deflection is in this case the length (A E + F B). If, however, the spider be not such a

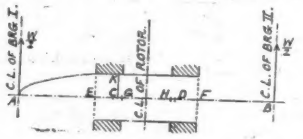


FIG. 11

good fit upon the shaft and be considered to bear hard at the two points C, D (fig. 11) where E C = D F = the radius of the shaft, then throughout the length C D of the shaft the bending moment is uniform and equal to the maximum, and the length C D is bent into an arc of a circle.

But whether the portion of the shaft inside the spider hub be deflected or not, one thing is certain, that the portion G H does not carry the spider with it, and therefore, so far as deflection is concerned, may be left out of account. Hence, if we deduct the length C D inside the spider hub from the length A B between the centres of the bearings, we get the effective length of the shaft subject to deflection for an average case, and this is the case we will take into consideration.

Now the deflection d, of any portion of this uniform beam

$$= \frac{l^2}{8} \cdot \frac{M}{E.I.}$$

for the case in which the bending moment is constant, and therefore equal to the maximum ; where l is the length of that portion, M the bending moment, E the modulus of elasticity, and I the moment of inertia, using lb. and inches throughout

In the case of our shaft, after deducting the portion C D (fig. 11) the loading of the remainder, A C + D B, is equivalent to a single load concentrated at the centre C or D ; also, the section is not uniform, being designed only so as not to cut into a curve of constant maximum stress with vertex at A and passing through K. But that the centre line of the shaft does, in most cases bend approximately into an arc of circle may be shown

l is the effective length after deducting the central portion C D (fig. 11). Any greater refinement of calculation than this in such cases usually costs more than it is worth.

Substituting $\pi D^4/64$ for I, where D is the diameter at C or D, also $W/4$ for M, and taking E = 30,000,000,

$$\text{we have that } d = \frac{\cdot 021}{10^6} \cdot \frac{Wl^3}{D^4}.$$

The shaft is usually designed so that the deflection due to the weight of the rotor alone should be about 7 per cent. of the air-gap, and to this deflection has to be added the extra deflection of the shaft, due to the magnetic pull, also the deflection of the stator frame, both of which are uncertain quantities and difficult to calculate ; so that the total deflection comes to about double the deflection calculated above for the shaft, due to the weight of the rotor alone.

In order to reduce the risk of the portion of the shaft under compression receiving any permanent set during the operation of forcing the shaft into the spider, it is advisable to arrange for the full pressure to come on only at the final forcing of the spider into position. If the operation be arranged as shown in fig. 12, not only is the outer end of the spider unguided, so that there is a chance of the alignment not being correct, but also the pressure comes on right from the start, so that the length of the shaft under compression is greater ; whereas, if it be arranged as in fig. 13, where the spider is a sliding fit at the start, the length is reduced and also

FIG. 12.

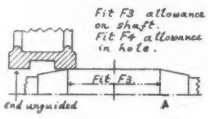


FIG. 13.

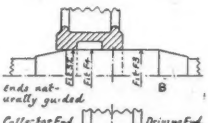
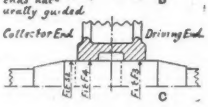


FIG. 14.



the shaft is in the position of being a column with the base rigidly fixed, thus again increasing the strength. This arrangement can be simply effected by the following device :—

It is the custom in large manufacturing concerns for the allowance for the fit to be left on the shaft, the hole being the even dimension ; but there are certain necessary exceptions, *e.g.*, the force fit for a coupling is different from that for a pulley, and seeing that it is not known until the last moment whether the machine is to have a pulley or a coupling, the only way in this case is to make the shaft the even dimension and to allow for the fit on the pulley or coupling. On the other hand, in the case of a spider, ordinarily the hole would be the even dimension and the allowance on the shaft.

I will call the pulley fit, Fit F 2 : the spider fit, Fit F 3 ; and the coupling fit, Fit F 4 ; also the easiest sliding fit, Fit S 2.

If now the fits be arranged as in fig. 13, then the spider, being bored to Fit F 3, will slide over the part of the shaft which is ground to Fit F 4, and the final result will be as shown in fig. 14.

The shaft would be gripped by a special hollow mandrel hydraulic press, which would take hold of it close to the neck, hold both shaft and spider concentrically, and force the shaft direct into the spider. With such a machine it would be possible for the large expensive keys at present used to be reduced in size by one-half ; and this is where a large firm has the pull over a small one, in that a small firm cannot afford thousand-ton hydraulic presses, and often not even proper grinding machines for differentiating easily between the various fits.

The outstanding features in the design of an end shield are (1) that it may be massive, being a stationary portion of the machine, and (2) that it may be designed on the Grade I style, *i.e.*, on simple monolith lines if tight for room. The shape of an end shield, especially that portion of it which shrouds the stator winding, is governed by considerations other than those purely of mechanical severity. From its very nature it must be a combination of bent struts and crooked tie-rods in cast-iron. If the design with a certain thickness of material looks too weak, it may be reinforced, if economy of space is essential, not only by ribbing it up, but also alternatively, by increasing the thickness of the metal. Thus, if $\frac{7}{16}$ in. looks too weak, make it $\frac{1}{2}$ in. ; and if $\frac{1}{2}$ in. thick looks too weak, make it $\frac{9}{16}$ in.

The redeeming feature of this Grade I style of designing is that it conduces to ease in moulding. When an article is like a plain plate, there is not so much slicking of the mould as when there is an array of ribs. Under these conditions cheapness of moulding may offset any extra weight of metal required.

In the case of pipe-ventilated end shields at the non-driving end, the plain plate style is necessary, because there the ribs would block the air passage.

The great advantage of employing end-shield bearings over pedestal bearings and protection caps, is that the former, having only a single plate beyond the stator winding, do not necessitate so long a shaft, thus improving deflection. To take an actual example, the shaft of a motor, designed to give 50 H.P. at 720 revolutions, had to be lengthened exactly 6 in. to accommodate

pedestal bearings and protection caps in place of the usual end shields.

The deflection of a shaft is a direct function of the cube of the length, and an inverse function of the fourth power of the diameter; and when we are amongst such high powers as these, we are liable very easily to have the machine too weak in point of deflection before we have gone far.

In the case of explosion-proof motors the ribbed style is necessary, because there the ribs are used to dissipate the heat. The ribs would be all on one side of the end shield, and seeing that cast-iron is six times as strong in compression as in tension, this points to the conclusion that the ribs should be on the inside and in compression, while the plate should be on the outside and in tension; especially as the heat is conducted away equally well whichever side of the plate the ribs are on. The explosion of marsh gas and air may rise to 130 lb. per sq. in., and the end shields and collector cover should be designed strong enough to resist this.

Under the influence of the explosion, the end shield tends to assume a spherical shape. Those portions of its contour which shroud the stator end-windings, and which are, or should be already spherical, are in pure tension. If they deviate from the true spherical form, they are by the amount of such deviation subject to compound stresses, analogous to those in a crooked tie-rod under a load due to gravity. If truly spherical, and therefore in pure tension, they do not need any ribs, while as regards the flat plate which forms the end of the end shield, the ribs should be on the inside and in compression. On the outside they are a source of weakness rather than of strength. If a flaw occurs in the thin rib it does not matter in compression, whereas in tension it is like the weak link of a chain. The flange where the end shield is bolted to the stator frame can be ribbed externally to the spherical portion of the end shield, or it can be made thick enough to stand on its own merits.

The straining actions on an explosion-proof end shield are exactly opposite to those on an open type end shield. In the former, it is the flat plate at the end which requires special attention; whereas in the latter it is the curved portion round the stator end windings.

From an engineering point of view, the bearing at the driving end should be about three times as large as the bearing at the small end; but from a commercial point of view, they should be the same size at each end so as to be interchangeable.

The question whether to make the bearings the same size or not may be answered by saying that for small machines the commercial aspect should be predominant, and for larger machines the engineering; where to leave off is a matter for judgment.

In rope-driving third bearing machines it makes a convenient arrangement to have a coupling between the rotor and middle bearing, close to the latter, so that the rotor can be removed without dismantling the rope drive.

In working out the bearing pressures for such a case, the addition of the loads due to the pull of the ropes and the weight of the rotor respectively is vectorial, since the drive is hardly ever vertically downwards—*i.e.*, in the same direction as the dead weight.

In designing ball bearings provision has to be made for the rotor to take up its position at the magnetic centre of the machine, which does not always coincide with the geometrical centre. The maximum variation that is likely to occur in practice may be taken at ¼ in. on either side of the geometrical centre line.

FOREIGN AND COLONIAL TARIFFS ON ELECTRICAL GOODS.

Proposed New Dutch Tariff.

The Netherlands Government has recently prepared a proposed new tariff which is to be put into force on a date to be fixed by Royal Decree. The following are the rates of duty proposed to be levied on electrical and similar goods, but it must be borne in mind that they are subject to alteration before the tariff is finally put into force.

Asbestos, mica (not specially mentioned)	Free
Graphite	Free
Rails, sleepers, fish plates or connecting plates, slide rails, points, crossings, chairs, &c.	Free
Rails fastened on steel or iron sleepers (transportable track); points and crossings formed of rails of a height of not more than 10 centimetres	6 % ad val.
Axles, wheels, tires, pressed plates for frames of vehicles and similar parts of under-frames of railway and tramway rolling stock, if imported separately and not separately mentioned	6 % ad val.
Axles, wheels and tires, in the state in which they leave the mould	3 ,,
Articles and manufactures of iron not separately mentioned, galvanised, &c.	12 ,,
Copper:	
Cables and wire for electric installations (insulated), and other copper wire having material wound, spun, or plaited round or otherwise covering it ...	6 ,,
Articles and manufactures of copper, brass and bronze, not separately mentioned in the tariff:—	
(*a*) Roughly worked or further worked, not separately specified	10 % ad val.
(*b*) Polished, lacquered, varnished, painted, nickelled, silvered, gilt or otherwise made up or ornamented, not separately mentioned	12 ,,
Note.—Copper alloys containing more than 50 per cent. of copper are to be regarded as copper or bronze.	
Aluminium wire	3 ,,
Earthenware and pottery not specially mentioned in the tariff, and porcelain	12 ,,
Glass globes for the manufacture of incandescent lamps	Free
Articles of glass or crystal not separately mentioned in the Tariff	12 % ad val.
Asbestos paper	1 florin per 100 kg.
Asphalt paper	20 ,, ,,
Boilers, pump and pump appliances, air compressors, accessories for steam installations and the like ...	6 % ad val.
Accumulators	Free
Dynamos and electromotors	3 % ad val.
Hoisting and conveying appliances, whether worked by machine or hand power	6 ,,
Appliances (apparatus) not being machine or hand tools, not separately mentioned	6 ,,
Other tools, not separately mentioned	Free
Parts of tools—	
(*a*) At once recognisable as being parts of tools exempt from duty	Free
(*b*) Other...	6 % ad val.
Implements, not separately mentioned	Free
Parts of driving machinery, such as axles, couplings, crankshaft bearings, transmission belts, &c. ...	6 % ad val.
Note to machinery headings above.—If an article subject to duty under any of these headings is imported fixed or coupled to an article exempt from duty, the whole shall be subject to duty at the rate applicable to the dutiable object.	
Electrical instruments and apparatus not separately mentioned	6
Lamps and ornaments for electric or other means of lighting, with or without the globes belonging thereto, not separately mentioned	12 ,,
Rubber in sheets, rods, cords, tubes, &c.	3 ,,
Rubber manufactures not specially mentioned in the tariff	12 ,,
Celluloid sheets, &c.	Free
Celluloid manufactures	12 % ad val.
Asbestos, even if mixed with other substances: worked not specially mentioned	6 ,,
Articles if not specially mentioned	12 ,,
Mica: in sheets not more than 1½ mm. thick ...	6 ,,
Articles if not specially mentioned	12 ,,

PATENTS EXPIRING IN 1911.

(*Continued from page* 904.)

29,587. December 14th, 1897. "Dynamo-electric machines." British Thomson-Houston Co. (E. D. Priest.)—Relates to the construction of dynamos and electric motors, and more particularly to the armature shaft bearings and means for lubricating the same. This invention is described in connection with an electric railway motor. The field-magnet frame is constructed in two parts enclosing the armature; these when bolted together are supported at one end by the car axle, and at the other by a spring supported bar on the truck. The bearings are mounted in boxes detachably secured to the lower half of the field-magnet frame. These boxes are provided with inwardly projecting lugs forming guides for the brasses which are provided with adjusting screws capable of being locked at their outer ends by cotter pins.

29,590. December 14th, 1897. "Dynamo-electric machines." British Thomson-Houston Co. (E. D. Priest.)—Comprises various detail improvements in the construction of dynamos and motors, more particularly such as are designed for propelling vehicles on electric railways. The field magnet frame is cast in a single piece, and is provided with removal frame heads which completely enclose the ends of the motor. The bearings are formed by inwardly projecting parts of the frame heads, which support the brasses and extend under the overhanging ends of the armature winding and commutator shell, so as to economise space. The frame head is formed on its inner side with curved flanges which receive the oil cast off by the oil throwers and in the latter case, direct it into the external cup; similar provision is made at the opposite end for receiving the oil from an oil thrower. A cover encloses a chamber in which are placed oil and waste for lubricating the armature shaft. Dust is excluded from the shaft by a spring cover. Each of the field poles is surrounded by a cast metal spool or by a sheet metal punching which supports the coil. Laminated pole pieces are secured to the field magnet by bolts; the laminæ of which they are composed have their curved edges partly concentric and partly eccentric with the armature. The armature has a laminated body mounted on a sleeve formed at one end with a flange, between which and the head it is clamped by a nut. An extension of the flange forms a support for the overhanging ends of the armature conductors. The commutator segments are mounted on a shell secured to the shaft, and are held between a bevelled extension and an adjustable clamping ring. Doors are provided for obtaining access to the commutator or field coils. The brush-holders may be carried by a ring mounted on the inner side of the frame head and capable of being rotated so as to permit of the brushes being inspected, but normally held in position by a locking device. The brush boxes or sockets are shrunk on to elliptical studs carried by plates capable of being adjusted on the ring. The carbon brushes are maintained in contact with the commutator by spiral springs. For the purpose of dismounting the armature for repairs, the motor is placed on a truck running on rails in a suitable framework; the armature shaft is supported between a fixed and an adjustable centre, as in a lathe, and after unscrewing one of the frame heads the field magnets are moved aside on the truck.

30,544. December 25th, 1897. "Electric welding." O. PARPART.—Relates to apparatus for welding longitudinal joints of tubes, such as bicycle tubes. The poles of a transformer are connected with the standards which are insulated from the frame of the machine, and carry supports for the copper disks which revolve in contact with the tube on opposite sides of the joint. The inclination of the disks can be adjusted, as well as their position. A little in front of the disks are placed the pressure rolls which complete the welding. They are insulated from the standards, and are driven by suitable gearing. Fore and aft of the welding apparatus are situated pairs of draught rolls, which feed the tubes forward. A guide is placed before the first pair of feed rolls, and a second guide between them and the welding apparatus to ensure the joint of the tube being upwards. Additional rolls on the delivery side of the machine keep the tube straight. For welding taper tubes special rolls of snail-cam section are employed.

30,848. December 31st, 1897. "Railway points and signals." I. A. TIMMIS.—The points are operated by the electromotor, the motion of which is transmitted through the worm to a screwed sleeve, the sleeve having stops engaging the elbow lever, which is adjustably connected to the points rod. The lever is normally locked by the weighted lever. In operation, the first movement of the sleeve causes the incline cam to disengage the lever, and the further movement of the sleeve operates the points, after which the lever returns and locks the points in their altered position.

30,923. December 31st, 1897. "Cage lifts." H. H. LEIGH. (F. J. Sprague.)—Relates to electrically-actuated lifts. Two motors in series are employed. Each armature shaft is fitted with a pair of worms respectively. One pair of worms engage with two worm-wheels on the shaft of the winding drum, and the other pair of worms with two wheels on a shaft, which is geared positively with the drum shaft by spur-wheels. Synchronous working of the motors is thus ensured. One half of the drum is made with a right-hand groove, and the other with a left-hand grove. The two pairs of ropes leading to the cage are wound on the middle portion of the drum, and two other pairs leading to the balance weight are coiled on the ends of the drum. Guide pulleys for the ropes are mounted on a shaft threaded oppositely at its ends with a pitch equal to that of the grooves on the drum, and driven from the shaft by gears and an intermediate shaft, which may be of any length. Shoe brakes, fitted to drums on the armature shafts, are normally applied by springs, and kept out of action by solenoids acting through toggle levers.

NEW PATENTS APPLIED FOR, 1911.

(NOT YET PUBLISHED.)

Compiled expressly for this journal by MESSRS. W. P. THOMPSON & Co., Electrical Patent Agents, 285, High Holborn, London, W.C., and at Liverpool and Bradford, to whom all inquiries should be addressed.

12,278. "Wall telephone or the like message-recording device." B. H. HALSTEAD. May 22nd.

12,295. "Electrical relays." SIEMENS BROS. & Co., LTD. (Siemens and Halske Akt.-Ges., Germany.) May 22nd. (Complete.)

12,328. "Escapement mechanisms and electric clocks." W. H. SHORTT. May 22nd.

12,369. "Electromagnetic ignition device for internal-combustion engines." A. RITTER. May 22nd. (Complete.)

12,450. "Electrothermic contacts for electric fire-signalling bells." SOC. ANON. "LE DETECTIVE." (Convention date, May 23rd, 1910, France.) May 23rd. (Complete.)

12,483. "Dynamos." W. RUBEL. (Convention date, February 2nd, Germany.) May 23rd. (Complete.)

12,485. "Automatic electric fire alarms." O. RENNERT. (Convention date, May 23rd, 1910, Germany.) May 23rd. (Complete.)

12,528. "Means for attaching arms to telegraph and other such poles and the manufacture thereof." H. LENCH. May 24th.

12,536. "Electrically controlled weighing machines." A. SMITH and C. SOUTHALL. May 24th.

12,545. "Conduits for cables." (Convention date, January 25th, 1911, Germany.) May 24th. (Complete.)

12,546. "Protective cap for telephones." J. LINDENTHALER. May 24th.

12,571. "Shade holders for incandescent electric lights and the like." J. WATKINSON and A. E. PAYNE. May 24th.

12,576. "Phonic relays." SOC. DES ETABLISSEMENTS GAUMONT. (Addition to 9,364/11. Convention date, May 28th, 1910, France.) May 24th. (Complete.)

12,579. "Electric signal systems." BRITISH THOMSON-HOUSTON Co., LTD. (General Electric Co., United States.) May 24th.

12,580. "Electric signal systems." BRITISH THOMSON-HOUSTON Co., LTD. (General Electric Co., United States.) May 24th.

12,587. "Automatic starting devices for electric motors." H. J. HADDAN (G. H. Whittingham, United States.) May 24th. (Complete.)

12,619. "Dynamo and other electric machinery." J. F. GILL and J. N. CHAVIARA. May 25th.

12,641. "Electric curative bath." H. W. LAKE. (Zikmund & Co., Hungary.) May 25th. (Complete.)

12,708. "Secondary cells." A. COLLIS and T. JONES. May 26th.

12,730. "Telephone instruments." H. G. MATTHEWS. May 26th.

12,735. "Electric arc lamps." SIEMENS BROS. DYNAMO WORKS, LTD. (Siemens-Schuckertwerke G.m.b.H., Germany.) May 26th. (Complete.)

12,742. "Electric hammers." H. F. WHALTON. (Convention date, May 26th, 1910, United States.) May 26th. (Complete.)

PUBLISHED SPECIFICATIONS.

Copies of any of the Specifications in the following list may be obtained of MESSRS. W. P. THOMPSON & Co., 285, High Holborn, W.C., and at Liverpool and Bradford; price, post free, 9d. (in stamps).

1910.

CEILING ROSES FOR ELECTRIC LIGHT PENDANT FITTINGS AND THE LIKE. L. M. Waterhouse. 20,156. August 30th.

ATTACHMENT DEVICES FOR THE SHADES OF ELECTRIC LAMPS AND THE LIKE. J. Roberts and J. Prescott. 21,349. September 14th. (October 18th, 1910.)

TELEPHONIC APPARATUS. C. H. Johnson and A. S. Johnson. 21,359. September 14th.

INCANDESCENT ELECTRIC LAMPS. G. Ludecké and Imperial Lamp Works (Brimsdown), Ltd. 23,222. October 7th.

SECTION INSULATORS FOR OVERHEAD WIRES AND CABLES OF TRAMWAY, RAILWAY AND LIKE SYSTEMS. S. W. Mitchell and H. McP. Dudgeon. 25,369. November 1st.

TROLLEYS OR COLLECTORS FOR ELECTRIC CARS. C. H. Buck. 25,864. November 7th.

MEANS FOR VERIFYING THE OPERATION OF APPARATUS FOR DISTANT ELECTRICAL TRANSMISSION AND CONTROL OF OPERATIONS. E. Schneider. 28,700. December 9th.

REGULATION OF ALTERNATING-CURRENT GENERATORS WORKING IN PARALLEL. Siemens Bros. Dynamo Works. (Siemens-Schuckertwerke Ges.) 29,549. December 20th.

TELEPHONE EXCHANGE CIRCUITS. Siemens Bros. & Co. (Siemens & Halske Akt.-Ges.) 29,672. December 21st.

ELECTRO-MECHANICAL SELECTOR. E. G. Godfree. 10,706. April 30th. (May 28th, 1909.)

ELECTRIC MOTOR-DRIVEN CAPSTANS. J. H. Liddle. 10,748. May 2nd.

ELECTRIC CIRCUIT CONTROLLERS. Adams Mfg. Co. (Cutler-Hammer Mfg. Co.) 10,772. May 2nd.

MANUFACTURE OF INCANDESCENT ELECTRIC LAMPS. F. Harrison. 10,869. May 3rd.

DYNAMO-ELECTRIC MACHINES. T. von Zweigbergk. 10,970. May 3rd.

SYSTEM OF HEATING INTERIORS BY MEANS OF ELECTRIC RADIATORS. G. Murray. 11,013. May 4th.

TROLLEY POLES FOR ELECTRIC TRACTION SYSTEMS. E. M. Munro and Railless Electric Traction Co. 11,157. May 5th.

ELECTROLYTIC PRODUCTION OF LIGHT METALS, AND PARTICULARLY SODIUM. G. O. Seward, F. von Kugelgen and Von Bidder. 11,175. May 5th. (May 10th, 1909.)

STAGE ARC LAMPS. W. Walters. 11,559. May 10th.

LAMPS FOR MOTOR-CARS AND THE LIKE. S. O. Cowper-Coles. 14,159. June 11th.

ELECTRIC TRACTION SYSTEMS. E. M. Munro and Railless Electric Traction Co. 17,874. July 27th.

MAGNETIC SEPARATORS. H. L. Kessler and J. C. Kessler. 18,253. August 2nd.

IGNITING MAGNETOS OF INTERNAL-COMBUSTION ENGINES. J. H. Sagaer. 20,306. August 31st. (September 20th, 1909.)

INCANDESCENCE ELECTRIC LAMPS. C. Carangelo. 21,740. September 19th.

SUSPENDED HYGROSCOPIC SHIELD FOR SUSPENDED ELECTRICAL CONDUCTORS. Western Electric Co. (Western Electric Co.) 24,123. October 18th.

TELEPHONIC TRANSMITTERS. W. J. Marchant. 24,390. October 20th.

WATERPROOF PROTECTOR FOR ELECTRIC LAMPS. E. Widmer. 24,909. October 26th.

GALVANIC GAS CELLS. G. Braun and F. Schneider. 25,879. November 7th.

COMPENSATION OF POLYPHASE COMMUTATING DYNAMO-ELECTRIC MACHINES. Allgemeine Elektricitäts Ges. 26,685. November 16th. (November 16th, 1909.)

DYNAMO-ELECTRIC MACHINES. W. Holt. 26,880. November 19th.

MEANS FOR ELECTRICALLY IGNITING MINERS' SAFETY LAMPS. J. Prestwich. 26,892. November 19th.

RECTIFICATION OF ALTERNATING ELECTRIC CURRENTS AND DEVICES FOR USE THEREIN. Electromechanische Werke Ges. 27,060. November 19th. (November 22nd, 1909.)

POWER FACTOR OF REPULSION MOTORS. Siemens Bros. Dynamo Works. (Siemens-Schuckertwerke Ges.) 27,170. November 18th.

OVERHEAD SYSTEMS FOR TRANSMITTING ELECTRICITY. J. Paul. 28,687. December 9th. (December 21st, 1909.)

MEANS FOR REGULATING ELECTRICALLY-OPERATED DRIVING SYSTEMS. Crompton and Co., J. C. Macfarlane, H. Burge and A. Williams. 29,728. December 21st.

1911.

ELECTRIC STORAGE CELLS OR BATTERIES. R. Pape. 906. January 12th.

ELECTRICITY METER WHICH INDICATES THE CONSUMPTION ABOVE A CERTAIN ENERGY. Allgemeine Elektricitäts Ges. 1,930. January 25th. (February 9th, 1910.)

ELECTROMAGNETIC RELAY DEVICES. Adams Mfg. Co., Ltd. (Cutler-Hammer Mfg. Co., Ltd.) 2,249. January 28th. (Divided application on No. 7,302 of 1910. April 25th.)

MAGNETO-ELECTRIC MACHINES. A. E. Fletcher. 2,434. January 31st.

ELECTRIC TRANSFORMERS. F. B. Koopman and Pontelec Welding Patents, Ltd. 4,911. February 27th. (Divided application on No. 10,694 of 1910. April 30th.)

ARRANGEMENTS FOR THE COOLING OF ROTORS OF ELECTRICAL MACHINES. Siemens-Schuckertwerke Ges. 5,247. March 2nd. (March 2nd, 1910.)

ELECTRIC ORDER-SIGNALLING APPARATUS. Siemens Bros. & Co. (Siemens and Halske Akt.-Ges.) 6,626. March 16th. (Addition to No. 19,624 of 1909.)

BONDING DEVICES FOR ELECTRIC CABLES AND ELECTRIC FITTINGS. S. W. Martyn. 8,484. April 5th. (Divided application on No. 9,121 of 1910. April 23rd.)

ELECTRIC TRACTION ON ELEVATED CABLE TRACKS. Heisse and H. Schulte. 355. January 5th. (Divided application on No. 12,843 of 1910.)

SWITCHES ADAPTED FOR OPERATING THE ELECTRIC LAMPS OF ILLUMINATED SIGNS AND THE LIKE. F. A. Brown and J. C. Trapagna. 1,370. January 18th.

MAGNETO-ELECTRIC MACHINES. A. E. Fletcher. 2,436. January 31st.

AUTOMATIC TELEPHONE EXCHANGE CIRCUITS. Siemens & Halske Akt.-Ges. 2,783. February 2nd. (March 1st, 1910.)

PREPAYMENT ELECTRIC METERS. H. Aron Elektrizitätszahlerfabrik Ges. 3,450. February 10th. (April 6th, 1910.)

Kinks for the Blue-printing Room.—To test a print in the frame, breathe on the corner of the border line. If the line perceptibly darkens, the print is done.

Simple washing in water will make a good print if the paper is not aged. Ordinary commercial blue-print paper for sunlight exposure will keep from four to six weeks in a metal tube before commencing to deteriorate. However, if the paper is aged, or the print slightly over-exposed, the lines will appear pale blue and the background fairly dark after washing.

To make a good print with such paper, add enough of a previously prepared saturated solution of potassium bichromate to make the bath a pale amber colour. The effect of adding the solution is to intensify the background and bleach the lines, making a sharp contrasty print. It is not a bad plan to subject every print to a slight over-exposure and use the bichromate solution habitually.

For a pale print practically nothing can be done except to wash quickly, about ½ minute, as the water bath has a bleaching effect. Drying in a darkened room will prevent further bleaching.—J. J. O'Brien, in *Power*.